Nonarthritic Hip Joint Pain

Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability and Health From the Orthopaedic Section of the American Physical Therapy Association


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Recommendations*

**RISK FACTORS:** Clinicians should consider the presence of osseous abnormalities, local or global ligamentous laxity, connective tissue disorders, and nature of the patient’s activity and participation as risk factors for hip joint pathology. (Recommendation based on expert opinion.)

**DIAGNOSIS/CLASSIFICATION – NONARTHritic HIP JOINT PAIN:** Clinicians should use the clinical findings of anterior groin or lateral hip pain or generalized hip joint pain that is reproduced with the hip flexion, adduction, internal rotation (FADIR) test or the hip flexion, abduction, external rotation (FABER) test, along with consistent imaging findings, to classify a patient with hip pain into the International Statistical Classification of Diseases and Related Health Problems (ICD) categories of M25.5 Pain in joint, M24.7 Protrusio acetabula, M24.0 Loose body in joint, and M24.2 Disorder of ligament, and the associated International Classification of Functioning, Disability and Health (ICF) impairment-based categories of hip pain (b28016 Pain in joints) and mobility impairments (b7100 Mobility of a single joint; b7150 Stability of a single joint). (Recommendation based on weak evidence.)

**DIFFERENTIAL DIAGNOSIS:** Clinicians should consider diagnostic categories other than nonarthritic joint pain 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 impairments of body function. (Recommendation based on expert opinion.)

**EXAMINATION – OUTCOME MEASURES:** Clinicians should use a validated outcome measure, such as the Hip Outcome Score (HOS), the Copenhagen Hip and Groin Outcome Score (HAGOS), or the International Hip Outcome Tool (HOT-33), before and after interventions intended to alleviate the impairments of body function and structure, activity limitations, and participation restrictions in individuals with nonarthritic hip joint pain. (Recommendation based on strong evidence.)

**EXAMINATION – PHYSICAL IMPAIRMENT MEASURES:** When evaluating patients with suspected or confirmed hip pathology over an episode of care, clinicians should assess impairments of body function, including objective and reproducible measures of hip pain, mobility, muscle power, and movement coordination. (Recommendation based on moderate evidence.)

**INTERVENTION – PATIENT EDUCATION AND COUNSELING:** Clinicians may utilize patient education and counseling for modifying aggravating factors and managing pain associated with the nonarthritic hip joint. (Recommendation based on expert opinion.)

**INTERVENTION – MANUAL THERAPY:** In the absence of contraindications, joint mobilization procedures may be indicated when capsular restrictions are suspected to impair hip mobility, and soft tissue mobilization procedures may be indicated when muscles and their related fascia are suspected to impair hip mobility. (Recommendation based on expert opinion.)

**INTERVENTION – THERAPEUTIC EXERCISES AND ACTIVITIES:** Clinicians may utilize therapeutic exercises and activities to address joint mobility, muscle flexibility, muscle strength, muscle power deficits, deconditioning, and metabolic disorders identified during the physical examination of patients with nonarthritic hip joint pain. (Recommendation based on expert opinion.)

**INTERVENTION – NEUROMUSCULAR RE-EDUCATION:** Clinicians may utilize neuromuscular re-education procedures to diminish movement coordination impairments identified in patients with nonarthritic hip joint pain. (Recommendation based on expert opinion.)

*These recommendations and clinical practice guidelines are based on the scientific literature accepted for publication prior to January 2013.

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**Introduction**

**AIM OF THE GUIDELINES**

The Orthopaedic Section of the American Physical Therapy Association (APTA) has an ongoing effort to create evidence-based practice guidelines for orthopaedic physical therapy management of patients with musculoskeletal impairments described in the World Health Organization’s International Classification of Functioning, Disability and Health (ICF). This guideline is intended to provide practical management recommendations for clinicians and other health care professionals in clinical settings.
Nonarthritic Hip Joint Pain: Clinical Practice Guidelines

Introduction (continued)

Classification of Functioning, Disability and Health (ICF). 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 orthopaedic 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 orthopaedic physical therapists
• Provide information for payers and claims reviewers regarding the practice of orthopaedic physical therapy for common musculoskeletal conditions
• Create a reference publication for orthopaedic physical therapy clinicians, academic instructors, clinical instructors, students, interns, residents, and fellows regarding the best current practice of orthopaedic physical therapy

STATEMENT OF INTENT
These guidelines are not intended to be construed or to serve as a standard of medical care. 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.

Methods

Content experts were appointed by the Orthopaedic Section, APTA as developers and authors of clinical practice guidelines for musculoskeletal conditions of the hip that are commonly treated by physical therapists. These content experts were given the task to identify impairments of body function and structure, activity limitations, and participation restrictions, described using International Classification of Functioning, Disability and Health (ICF) terminology, that could (1) categorize patients into mutually exclusive impairment patterns on which to base intervention strategies, and (2) serve as measures of changes in function over the course of an episode of care. The second task given to the content experts was to describe the supporting evidence for the identified impairment-pattern classification as well as interventions for patients with activity limitations and impairments of body function and structure consistent with the identified impairment-pattern classification. It was also acknowledged by the Orthopaedic Section, APTA content experts that only performing a systematic search and review of the evidence related to diagnostic categories based on International Statistical Classification of Diseases and Related Health Problems (ICD) terminology would not be sufficient for these ICF-based clinical practice guidelines, as most of the evidence associated with changes in levels of impairment or function in homogeneous populations is not readily searchable using the ICD terminology. Thus, the authors of this guideline independently performed a systematic search of MEDLINE, CINAHL, and the Cochrane Database of Systematic Reviews (1967 through January 2013) for any relevant articles related to classification, examination, and intervention strategies for nonarthritic hip joint pain. Additionally, when relevant articles were identified, their reference lists were hand searched in an attempt to identify other relevant articles. Articles from the searches were compiled and reviewed for accuracy by the authors. This guideline was issued in 2014 based on publications in the scientific literature prior to January 2013. This guideline will be considered for review in 2018, or sooner if new evidence becomes available. Any updates to the guideline in the interim period will be noted on the Orthopaedic Section of the APTA website (www.orthopt.org).

LEVELS OF EVIDENCE
Individual clinical research articles were graded according to

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Methods (continued)

criteria described by the Centre for Evidence-based Medicine, Oxford, UK (http://www.cebm.net) for diagnostic, prospective, and therapeutic studies. If the 2 content experts did not agree on a grade of evidence for a particular article, a third content expert was used to resolve the issue. An abbreviated version of the grading system is provided below.

<table>
<thead>
<tr>
<th>GRADES OF EVIDENCE</th>
<th>STRENGTH OF EVIDENCE</th>
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<tbody>
<tr>
<td>I</td>
<td>Evidence obtained from high-quality diagnostic studies, prospective studies, or randomized controlled trials</td>
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<tr>
<td>II</td>
<td>Evidence obtained from lesser-quality diagnostic studies, prospective studies, or randomized controlled trials (eg, weaker diagnostic criteria and reference standards, improper randomization, no blinding, less than 80% follow-up)</td>
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<tr>
<td>III</td>
<td>Case-control studies or retrospective studies</td>
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<td>IV</td>
<td>Case series</td>
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<td>V</td>
<td>Expert opinion</td>
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GRADES OF EVIDENCE

The overall strength of the evidence supporting recommendations made in these guidelines was graded according to guidelines described by Guyatt et al, as modified by MacDermid et al, and adopted by the coordinator and reviewers of this project. In this modified system, the typical A, B, C, and D grades of evidence have been modified to include the role of consensus expert opinion and basic science research to demonstrate biological or biomechanical plausibility.

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<tr>
<th>GRADES OF RECOMMENDATION</th>
<th>STRENGTH OF EVIDENCE</th>
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<tr>
<td>A</td>
<td>Strong evidence</td>
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<td></td>
<td>A preponderance of level I and/or level II studies support the recommendation. This must include at least 1 level I study</td>
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<tr>
<td>B</td>
<td>Moderate evidence</td>
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<td>A single high-quality randomized controlled trial or a preponderance of level II studies support the recommendation</td>
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<tr>
<td>C</td>
<td>Weak evidence</td>
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<td>A single level II study or a preponderance of level III and IV studies, including statements of consensus by content experts, support the recommendation</td>
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<tr>
<td>D</td>
<td>Conflicting evidence</td>
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<td>Higher-quality studies conducted on this topic disagree with respect to their conclusions. The recommendation is based on these conflicting studies</td>
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<td>E</td>
<td>Theoretical/foundational evidence</td>
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<td>A preponderance of evidence from animal or cadaver studies, from conceptual models/principles, or from basic science/bench research supports this conclusion</td>
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<tr>
<td>F</td>
<td>Expert opinion</td>
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<td>Best practice based on the clinical experience of the guidelines development team</td>
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REVIEW PROCESS

The Orthopaedic Section, APTA also selected consultants from the following areas to serve as reviewers of the early drafts of these clinical practice guidelines:

- Claims review
- Coding
- Rheumatology
- Hip pain rehabilitation
- Medical practice guidelines
- Manual therapy
- Movement science
- Orthopaedic physical therapy residency education
- Orthopaedic physical therapy clinical practice
- Orthopaedic surgery
- Outcomes research
- Physical therapy academic education
- Physical therapy patient perspective
- Sports physical therapy residency education
- Sports rehabilitation

Comments from these reviewers were utilized by the authors to edit these clinical practice guidelines prior to submitting them for publication to the Journal of Orthopaedic & Sports Physical Therapy. In addition, several physical therapists practicing in orthopaedic and sports physical therapy settings volunteered to provide feedback on initial drafts of these clinical practice guidelines related to the guidelines’ usefulness, validity, and impact.

CLASSIFICATION

The primary ICD-10 codes associated with nonarthritic hip pain are M25.5 Pain in joint, M24.7 Protrusio acetabuli, M24.0 Loose body in joint, and M24.2 Disorder of ligament.

The corresponding ICD-9-CM codes and conditions are: 719.45 Joint pain, 718.65 Unspecified intrapelvic protrusion of acetabulum, 718.15 Loose body in joint, and 718.5 Other derangement of joint pelvic region and thigh.

Other ICD-10 codes that may be associated with nonarthritic hip joint pain are:

- M21.0 Valgus deformity, not elsewhere classified
- M21.1 Varus deformity, not elsewhere classified
- M21.2 Flexion deformity
- M24.3 Pathological dislocation and subluxation of joint, not elsewhere classified
- M24.4 Recurrent dislocation and subluxation of joint
Methods (continued)

• M24.5 Contracture of joint
• M24.6 Ankylosis of joint
• M24.9 Joint derangement, unspecified
• M25.0 Hemarthrosis
• M25.3 Other instability of joint
• M25.4 Effusion of joint
• M25.6 Stiffness of joint, not elsewhere classified
• M25.7 Osteophyte
• M25.8 Other specified joint disorders
• M25.9 Joint disorder, unspecified
• Q65.6 Unstable hip
• R29.4 Clicking hip
• S73 Dislocation, sprain and strain of joint ligaments of hip

The primary ICF body function codes associated with nonarthritis hip joint pain are b28016 Pain in joints, b7100 Mobility of a single joint, and b7150 Stability of a single joint. Other ICF body function codes that may be associated with this condition are b7300 Power of isolated muscles and muscle groups, b7401 Endurance of muscle groups, b7603 Supportive functions of arm and leg, b770 Gait pattern functions, and b7800 Sensation of muscle stiffness.

The primary ICF body structure code associated with nonarthritis hip joint pain is s75001 Hip joint. Other ICF body structure codes associated with this condition are s7402 Muscles of pelvic region and s7403 Ligaments and fasciae of pelvic region.

The primary ICF activities and participation codes associated with nonarthritis hip joint pain are d4104 Standing, d4151 Maintaining a squatting position, d4153 Maintaining a sitting position, d4552 Running, d4500 Walking short distances, and d4501 Walking long distances.

Other ICF activities and participation codes that may be associated with nonarthritis hip joint pain are:
• d2303 Completing the daily routine
• d4101 Squatting
• d4154 Maintaining a standing position
• d4302 Carrying in the arms
• d4303 Carrying on shoulders, hip and back
• d4351 Kicking
• d4502 Walking on different surfaces
• d4551 Climbing
• d4553 Jumping
• d4600 Moving around within the home
• d4601 Moving around within buildings other than home
• d4602 Moving around outside the home and other buildings
• d465 Moving around using equipment
• d5204 Caring for toenails
• d5400 Putting on clothes
• d5401 Taking off clothes
• d5402 Putting on footwear
• d5403 Taking off footwear
• d5701 Managing diet and fitness
• d9201 Sports
• d9209 Recreation and leisure
Pathoanatomical Features

Understanding the complex relationship among the labrum, the bony architecture of the acetabulum and femur, as well as the proximate soft tissues, such as the ligaments and muscles, is important for diagnosis and optimal treatment of individuals with mechanical hip pain.

The proximal femur articulates with the acetabulum to form the hip joint. The femoral head is two thirds of a sphere covered with hyaline cartilage and enclosed in a fibrous capsule. The femoral head is connected to the femoral shaft via the femoral neck. In the frontal plane, the femoral neck lies at an angle to the shaft of the femur. This “angle of inclination” is normally 120° to 125° in the adult population. In the transverse plane, the proximal femur is oriented anterior to the distal femoral condyles as a result of a medial torsion of the femur, with a normal range between 14° and 18° of anteversion. The hip joint is a “ball and socket” synovial joint with articular cartilage and a fully developed joint capsule, allowing movement in all 3 body planes.

The articular cartilage of the femoral head is thickest in the anterior-superior region, except where it is absent at the fossa capitis. In normal individuals, the cartilage is thickest in the central portion around the ligamentum teres. This corresponds to the area of maximum weight-bearing forces. The articular cartilage of the acetabulum is horseshoe shaped and thickest superiorly. It is continuous with the cartilage that lines the acetabular labrum. Articular cartilage is avascular and aneural.

The joint capsule attaches around the acetabular rim proximally and distally at the intertrochanteric line. Along with the labrum, the capsule provides passive stability to the hip joint. The iliofemoral, ischiofemoral, and pubofemoral ligaments assist the capsule in providing stability to the joint. These 3 strong ligaments reinforce the joint capsule, the iliofemoral and pubofemoral ligaments anteriorly, and the ischiofemoral ligament posteriorly.

Control of the hip during movement involves complex interactions between the nervous, muscular, and skeletal systems. The 27 muscles that cross the hip joint act as primary movers and dynamic stabilizers of the hip and lower extremity. The gluteus medius is the primary source of dynamic stabilization for the hip joint in the frontal plane. Weakness of this muscle has been traditionally implicated as playing a role in functional impairments. The iliopsoas complex is the primary hip flexor and may play a role in stabilizing the femoral head anteriorly, given its location across the anterior hip joint. The gluteus maximus is the most powerful hip extensor. The hip external and internal rotators’ role in stabilization may become more crucial when the acetabular labrum...
Nonarthritic Hip Joint Pain may be related to numerous underly-
ing causes, such as femoroacetabular impingement, osteo-
chondral lesions, loose bodies, ligamentum teres injury, and
septic conditions. It should be noted that these conditions are not necessarily mutually
exclusive, and at times may be related to each other. Recently,
an increased focus has been placed on identifying acetabular
tears as one cause of hip pain and on understanding the
underlying mechanisms in the development of labral tears.
These underlying mechanisms may be related to variations in
joint anatomy combined with specific activities, or of traumatic
onset. Two anatomical variants have been described: femoro-
acetabular impingement and structural instability.

Femoroacetabular Impingement
Structural variations of the proximal femur or acetabulum
may result in a femoroacetabular impingement, which is
described as abnormal contact between the femoral head/
neck and the acetabular margin and has been associated with
labral and chondral damage. Osseous abnormalities pro-
posed to contribute to labral tears due to femoroacetabular
impingement include bony malformations in the proximal
femur or the acetabulum, resulting in premature abutment
of the femoral neck into the acetabulum during the motion of
hip flexion with internal rotation. The presence of a slipped
capital femoral epiphysis has also been noted to cause femo-
roacetabular impingement. With repetitive motions into
the position of impingement, the acetabular labrum will
undergo excessive shear and compressive forces, which may
lead to eventual injury. Femoroacetabular impingement has been
further classified into 3 categories, based on the specific
osseous abnormality present. Cam impingement is the result
of asphericity of the femoral head, which is often related to
a slipped capital femoral epiphysis or other epiphyseal in-
jury or protrusion of the head-neck junction occurring at
the proximal femur. Pincer impingement is the result of
acetabular abnormalities, such as general (protrusio) and
localized anterosuperior acetabular overcoverage of the fe-
mur (acetabular retroversion), which are described in more
detail in the Imaging section. Excessive acetabular cover-
age anteriorly may result in premature abutment of the
femoral neck on the anterior acetabular rim. Impingement
may be more pronounced when relative femoral retrover-
sion and anteversion are, respectively, combined with ac-
etabular retroversion and anteversion. The third category is
a combination of the cam and pincer impingement, which is
likely the most common category. Radiographic evidence of
femoroacetabular impingement is common in active pa-
tients with hip complaints. Studies have suggested that the
abnormal movement at the hip joint occurring secondary to
femoral acetabular impingement may lead to labral lesions
and cartilage damage. The end stage of this process may
lead to the development of secondary hip joint osteoarthritis
(secondary OA).

Gender differences have been described in individuals with
labral tears secondary to osseous abnormalities. Cam
impingement morphology is twice as prevalent in males than in
females. Pincer lesions are more common in middle-aged,
active women. In the North American population, the most
common area of labral tears occurs in the anterior–superior
(weight-bearing) region of the labrum. In 2 studies with
limited sample sizes (n=8), labral tears in the Japanese popu-
lation have been reported at a greater frequency in the pos-
terior region.

Structural Instability
Hip instability may be defined as extraphysiologic hip motion
that causes pain with or without the symptom of hip joint un-
steadiness. Hip instability may be traumatic, atraumatic,
or secondary to bony or soft tissue abnormality. Factors re-
lated to structural instability of the joint include a shallow
acetabulum and an excessive femoral anteversion. Excessive
acetabular anteversion or retroversion, inferior acetabulum
insufficiency, and a neck shaft angle greater than 140° may
also be a component of structural instability. Determination
of femoral version is further described in the Imaging section
of this guideline. These conditions, particularly when com-
bined with repetitive forceful activities, have been associated
with the development of labral tears.

A shallow acetabulum (acetabular dysplasia) has been asso-
ciated with labral tears due to structural instability. In a hip
with structural instability, insufficient coverage of the femoral
head may result in repetitive shear stresses to the acetabular
labrum as it attempts to maintain the congruent relationship
between the femur and the acetabulum. Insufficient cover-
age may present as decreased anterior coverage with exces-
sive acetabular anteversion or decreased posterior coverage
with acetabular retroversion. Continued repetitive stresses
may result in further instability of the hip joint. Structural
instability due to dysplasia is thought to be more common in
females.

The presence of dysplasia in adult individuals with hip pain
has been discussed. In a cross-sectional study by Jacobsen
and Sonne-Holm, the prevalence of hip joint dysplasia
ranged from 5.4% to 12.8%. Birrell et al found the preva-
lence of dysplasia in patients with an initial complaint of hip
pain to be 32%. They also found no difference in the preva-
Acetabular Labral Tears
The acetabular labrum is a fibrocartilaginous structure that extends from the osseous rim of the acetabulum and serves multiple functions. The labrum structure deepens the socket of the hip joint and acts as a buffer, decreasing forces transmitted to the articular cartilage. Adduction and internal rotation of the hip increase the acetabular joint volume, creating a seal. The labrum also contains free nerve endings that have been suggested to play a potential role in proprioception and potential sources of pain.

Acetabular labral tears have recently been identified as a potential source of hip pain and a possible precursor to hip OA. Although true estimates of the prevalence of labral tears are not currently available, in patients with mechanical hip pain, the prevalence of labral tears has been reported to be as high as 90%. In their review of studies examining individuals with hip or groin pain, Groh and Herrera found prevalence to be 22% to 55%.

Acetabular labral tears may occur as the result of acute trauma or of insidious onset. Traumatic mechanisms described involve rapid twisting, pivoting, or falling motions. A common mechanism in the athletic population includes forceful rotation with the hip in a hyperextended position. Other mechanisms of injury consist of a combination of anatomical variants with repetitive forces. Tears may also be insidious. Groh and Herrera found that up to 74% of labral tears are not associated with any specific event.

An increased incidence of acetabular labral tears has been described in a number of specific populations, in particular those individuals who subject the hip joint to specific repetitive stress. Narvani et al. found acetabular labral tears to be the cause of symptoms in 20% of athletes presenting with groin pain.

Labral tears may be seen in individuals throughout the age span; however, increasing age may be associated with the prevalence of labral tears. Tears have been observed in up to 96% of older individuals. In another study, 88% of patients older than 30 years were found to have labral detachment from the articular cartilage.

The diagnosis of a labral tear is often delayed, and it is often misdiagnosed. Recent advances in imaging have resulted in better identification of labral tears. Lage et al. described a system of classifying acetabular labral tears. The classifications are: radial flap, radial fibrillated, longitudinal peripheral, and abnormally mobile (partially detached). Radial flap tears, where the free margin of the labrum is disrupted, are the most commonly observed. Radial fibrillated tears involve characteristic fraying of the free margin of the labrum. Abnormally mobile tears are partially detached from the acetabular surface. The least common noted were longitudinal peripheral tears, which involve a tear along the acetabular-labral junction. Criteria to classify acetabular labral tears have been established; however, more research is needed to establish the association between labral tears and hip joint pain and to determine if labral tears are a risk factor for hip OA.

Ruptured Ligamentum Teres
The ligamentum teres originates from the edges of the acetabular notch and transverse acetabular ligament and attaches onto the fovea capitis of the femoral head. Though traditionally thought to play a minimal role in joint function, more recent findings suggest that this structure may play a role in stabilization. The ligamentum teres may be a strong intrinsic stabilizer that resists hip joint subluxation forces. It has the potential to act as a strong intra-articular ligament and an important stabilizer of the hip, particularly when the hip is externally rotated in flexion or internally rotated in extension. Several theories have been proposed to describe the exact function of the ligamentum teres, including a role in providing a “sling-like” stabilization of the hip joint as it wraps around the femoral head. Martin et al. utilized a ball-and-string model to demonstrate these potential functions of the ligamentum teres. Patients with tears of the ligamentum teres may develop hip microinstability. This condition of compromised stability, when combined with recreational and sports activities, may result in damage to the labrum and cartilage. This process may possibly explain the high association rate between tears of the ligamentum teres,
labral tears, and cartilage injury. Injuries to the ligamentum teres are generally considered rare. Rao et al found ligamentum teres injury in less than 8% of arthroscopy cases. Orthopaedic surgeons have reported a ruptured ligamentum teres as a significant arthroscopic finding in individuals reporting hip pain and dysfunction. Acute tearing of this structure has been described, however, the correlation between injuries to the ligamentum teres and clinical presentation is not well understood.

**Chondral Lesions**

Little is known about the prevalence of isolated chondral lesion (focal loss of cartilage on the articular surfaces); however, McCarthy et al found that 73% of patients with fraying or tearing of the labrum also had chondral damage. Anterior-superior cartilage lesions have been associated with dysplasia, anterior joint laxity, and the presence of femoroacetabular impingement. The combination of labral tears present greater than 5 years and full-thickness chondral lesions in those with higher alpha angles correlates with a greater magnitude of decreased hip range of motion, chondral damage, labral injury, and progression of OA.

Chondral lesions have been reported in younger, more active individuals as a source of hip pain. A traumatic injury pattern involving acute overloading through impact sustained by a blow to the greater trochanteric region has been described. This clinical hypothesis has been supported by arthroscopic findings.

**Loose Bodies**

The presence of loose bodies (small fragments of bone or cartilage within the joint) has been implicated as a disrupter of joint function in individuals presenting with hip pain. Numerous underlying mechanisms have been described. Though the specific mechanisms underlying their presence may vary, their potential for being a cause of pain and/or mechanical disruption should be considered. Loose bodies, ossified and nonossified, may be present in the joint secondary to a number of factors. Single fragments typically occur in the case of dislocation or osteochondritis dissecans. Multiple fragments are more common in conditions such as synovial chondromatosis.

**RISK FACTORS**

With the exception of traumatic injury, the specific cause of nonarthritic hip disorders is not clearly understood. Potential risk factors have been proposed. However, there is only minimal evidence to substantiate the relationship of these potential risk factors to nonarthritic hip joint disorders.

**Femoroacetabular Impingement**

**Genetics**

Previous investigation has established the genetic influence on severe osseous abnormalities, such as slipped capital femoral epiphysis and acetabula protrusion, but limited evidence exists specific to milder abnormalities. In 1 study, Pollard et al compared the radiographs of patients with symptomatic femoroacetabular impingement to 2 groups: 1 group included the patient’s siblings, and the second group included spouses of the patients and the siblings. Compared to the spouse controls, the siblings demonstrated a greater relative risk for cam and pincer deformity, respectively, suggesting that genetics is a possible risk factor for femoroacetabular impingement.

**Sex**

The individual’s sex may influence the type of osseous abnormality. Hack et al studied 200 asymptomatic volunteers and found that the prevalence of cam deformities was higher in men (25%) than in women (5.4%). In a cross-sectional, population-based study, a substudy of the Copenhagen City Heart Study I–III, Gosvig et al reported the prevalence estimates of osseous abnormalities by sex. More women (19%) demonstrated a deep acetabular socket (pincer deformity) than men (15%). More men (20%) demonstrated a pistol-grip (cam) deformity than women (5%).

**Structural Instability**

**Genetics**

Genetic factors have long been recognized in the etiology of dysplasia, particularly in the more severe cases such as congenital hip dislocation. Although studies are not available to demonstrate the genetic influence on milder forms of acetabular dysplasia thought to contribute to structural instability, it is likely that genetic factors play a role in structural instability.

**Ligamentous Laxity**

Ligamentous laxity of the hip joint, global or focal, has been proposed as a risk factor for the development of acatalabral tears. Global ligamentous laxity due to connective tissue disorders, such as Ehlers-Danlos, Down, and Marfan syndromes, has been implicated as a risk factor in the development of acatalabral tears.

A correlation between acatalabral labral tears and focal rotational laxity has been suggested. The focal laxity most commonly occurs as anterior capsular laxity secondary to...
The hip was positioned into flexion and internal rotation. They found the area of impingement when the hip was positioned into flexion and internal rotation. The area of impingement was similar to the area of labral and cartilage damage when the hip was positioned in flexion and internal rotation. Intraoperatively and determined that the anterosuperior car acetabulum. Sink et al used visual inspection of hip motion and articular cartilage damage has been shown at the site of impingement. Through visual assessment, labral lesions and articular cartilage damage were present in up to 87% of patients presenting with labral tear and compared the bony morphology of the involved hip to the uninvolved hip. Compared to the uninvolved hip, the involved hip had a higher prevalence of ossous abnormalities associated with dysplasia (structural instability) or femoroacetabular impingement.

### Ossous Abnormalities Associated With Structural Instability

Although femoral version has been studied extensively in the pediatric population, little research has been performed in the adult population. Abnormal version of the femur, either excessive anteversion or retroversion, may result in abnormal stresses on the hip joint. Ito et al. reported that patients with a labral tear demonstrated a reduced head-neck offset anteriorly compared to asymptomatic control subjects. Other observational studies suggest a relationship between osseous abnormalities and femoroacetabular impingement with the preoperative diagnosis. Delamination was assessed to be associated with femoral-side (cam) findings (odds ratio = 11.87); however, delamination was not associated with acetabular (pincer) findings (odds ratio = 0.65).

These findings suggest that cam impingement increases the risk of articular cartilage delamination; however, pincer impingement may be protective of the cartilage. This study, however, did not assess the association of the bony morphology with labral tears or hip pain. The presence of acetabular retroversion defined in their study as localized acetabular retroversion or acetabular overcoverage, defined as the hip having a labral tear demonstrated a reduced head-neck offset anteriorly compared to asymptomatic controls.
Clinicians should consider the presence of osseous abnormalities, local or global ligamentous laxity, connective tissue disorders, and nature of the patient’s activity and participation as risk factors for hip joint pathology.

**DIAGNOSIS/CLASSIFICATION**

The diagnosis of femoroacetabular impingement and the associated International Classification of Functioning, Disability and Health (ICF) diagnosis of joint pain and mobility impairment can be suspected when the patient presents with the following clinical and radiographic findings:

- Pain in the anterior hip/groin and/or lateral hip/trochanter region is reported
- Pain is described as aching or sharp
- The reported hip pain is aggravated by sitting
- The reported pain is reproduced with the hip flexion, adduction, internal rotation (FADIR) test
- Hip internal rotation is less than 20° with the hip at 90° of flexion
- Hip flexion and hip abduction are also limited
- Mechanical symptoms such as popping, locking, or snapping of the hip are present
- Conflicting clinical findings are not present
- Radiographic findings:
  - Cam impingement
    - Increased femoral neck diameter that approaches the size of the femoral head diameter
    - Alpha angle greater than 60°
    - Head-neck offset ratio less than 0.14
  - Pincer impingement
    - Increased acetabular depth
      - Coxa profunda (lateral center-edge angle greater than 35°)
      - Acetabular protrusion
    - Decreased acetabular inclination
      - Tönnis angle less than 10°
    - Acetabular retroversion
      - Crossover sign indicating localized anterosuperior overcoverage
      - Ischial spine projection into the pelvis

The diagnosis of structural instability and the associated ICF diagnosis of joint pain and mobility impairment can be suspected when the patient presents with the following clinical and radiographic findings:

- Anterior groin pain or generalized hip joint pain
- Pain is reproduced with the FADIR or FABER test
- Hip apprehension sign is positive
- Mechanical symptoms such as popping, locking, or snapping of the hip are present
- Conflicting clinical findings are not present
- Radiographic findings:
  - Increased acetabular inclination
  - Tönnis angle greater than 10°
  - Decreased femoral head coverage
  - Lateral center edge of Wiberg less than 25°
  - Anterior center-edge angle less than 20°
- Pain is described as aching or sharp
- Pain in the anterior hip/groin
- Pain is reproduced with the hip flexion, abduction, external rotation (FABER) test
- Anterior groin, lateral hip, or generalized hip joint pain is reported
- The reported pain is reproduced with the FADIR test or the sensation of instability when squatting
- Conflicting clinical findings are not present
- Imaging findings:
  - Labral tear
  - Magnetic resonance arthrography (MRA)

Clinicians should use the clinical findings of anterior groin or lateral hip pain or generalized hip joint pain that is reproduced with the FADIR or FABER test, along with corroborative imaging findings, to classify a patient with hip pain into the International Statistical Classification of Diseases and Related Health Problems (ICD) categories of M25.5 Pain in joint, M24.7 Protrusio acetabula, M24.0 Loose body in joint, and M24.2 Disorder of ligament, and the associated ICF impairment-based category of hip pain (b28016 Pain in joints) and mobility impairments (b7100 Mobility of a single joint; b7150 Stability of a single joint).

**DIFFERENTIAL DIAGNOSIS**

Potential differential diagnoses for nonarthritic hip joint pain are:

- Referred pain from lumbar facet disorders
- Referred pain from lumbar disc disorders
- Sacroiliac joint dysfunction
- Pubic symphysis dysfunction
Clinicians should consider diagnostic categories other than nonarthritic joint pain 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 impairments of body function.

IMAGING STUDIES
Imaging studies are used in conjunction with clinical findings to rule out serious diagnoses such as a cancer, osteonecrosis, or fracture. Imaging may also provide information regarding the bony structure of the femur and acetabulum as well as related soft tissue. Information from imaging studies should be evaluated in the context of the entire clinical presentation, where the clinician should have an understanding of imaging applications, associated results, and how these applications and results affect clinical decisions related to patient management—acknowledging that, often, findings from imaging are incidental and impact patient management only to the extent of providing education and reassurance to the patient.

Plain radiographs are the first imaging study in the differential diagnostic procedures. Radiographs are useful in detecting femoral and acetabular abnormalities associated with nonarthritic hip joint pain. Plain radiographs do not provide adequate detail regarding soft tissue morphology. Noncontrast magnetic resonance imaging (MRI) provides better detail for assessing soft tissue integrity; however, it has not been used extensively to assess intra-articular structures. MRA is commonly used to detect changes of the intra-articular structures. Techniques such as computed tomography and delayed gadolinium-enhanced MRI of cartilage have recently been implemented to assess articular cartilage integrity and assist with presurgical planning.

To detect osseous abnormalities, specific radiographic views are needed in addition to the standard hip protocol. Specific images to consider include (1) cross-table lateral view, (2) 45° or 90° Dunn view, (3) “frog” lateral view, and (4) false-profile view. These specific views allow the diagnosis of osseous abnormalities, such as femoroacetabular impingement and structural instability, proposed to be associated with nonarthritic hip joint pain. The osseous abnormalities are described below. The clinician is encouraged to refer to Clohisy et al for a thorough description of the measurement methods and representative figures. An alternative view has recently been introduced to measure the distance between the femoral neck and the acetabular rim when the hip is in 90° of flexion. It should be noted that variations of suggested normal measurements exist within the literature. In addition, the relationship between pain and bony abnormalities has not been fully established.

Measurements may be taken to evaluate for hip dysplasia, including the Tönnis angle (abnormal, greater than 10°), the lateral center-edge angle of Wiberg (abnormal, less than 25°), and the anterior center-edge angle of Lequesne (abnormal, less than 25°), as measured on a false-profile radiograph. The neck-shaft angle of the proximal femur is considered normal less than 120° and 140°. Radiographic images for hip femoroacetabular impingement and structural instability have been published.

Radiographic findings that support the clinical diagnosis of pincer femoroacetabular impingement include increased acetabular depth, decreased acetabular inclination, and acetabular retroversion. Acetabular depth, inclination, and retroversion are all assessed on the anterior/posterior view. Acetabular depth is determined by observing the relationship of the floor of the acetabulum and femoral head. Acetabular protrusion represents a deep acetabulum and is suggestive of pincer femoroacetabular impingement. Acetabular inclination is assessed using the Tönnis angle. Acetabuli having a Tönnis angle of 0° to 10° are considered normal, whereas those having an angle greater than 10° or less than 0° are considered increased and decreased, respectively. Hips with an increased Tönnis angle were considered to be at risk for structural instability, whereas those having a decreased in-
The radiographic finding to support the clinical diagnosis of structural instability is an increased acetabular inclination. Acetabular inclination may be assessed using the Tönnis angle, or the lateral center-edge angle of Wiberg. Both assessed from the anterior/posterior view. A Tönnis angle greater than 10° or a lateral center-edge angle less than 25° may indicate inadequate acetabular coverage of the femoral head.

MRI is useful in detecting musculotendinous pathology, such as iliopsoas tendinopathy. Although MRI is not used widely to detect intra-articular injury, some investigators report high accuracy (89%-95%) in detecting labral tears. Currently, the most common imaging procedure used to confirm the diagnosis of intra-articular pathology, such as labral tears or chondral lesions, is MRA. Contrast is injected into the hip joint to allow better visualization of the intra-articular structures. Compared to the gold standard of arthroscopic visual inspection, MRA has a sensitivity of 71% to 100% and a specificity of 44% to 71% in detecting a labral tear. All subjects in these studies had a clinically suspected labral tear. In a small cadaveric study, MRA demonstrated 60% sensitivity, 100% specificity, and 70% accuracy. In the same study, conventional MRI with a large field of view was 8% sensitive in detecting labral tears compared with findings at the time of arthroscopy. Diagnostic sensitivity was improved to 25% with a small-field-of-view MRA. In addition to soft tissue integrity, MRI or MRA may be used to detect osseous abnormalities previously described, such as the alpha angle or acetabular retroversion.

Computed tomography may be used to determine the osseous architecture of the hip. Current technologies allow for 3-D reconstruction of the hip anatomy and thus provide additional information that is useful in presurgical planning. Due to significantly higher radiation exposure with computed tomography as compared to other imaging modalities, it has not been widely used in the diagnosis of nonarthritic hip joint pain and is most often reserved just for presurgical planning.

The use of image-guided injections for the purpose of diagnosis has been described. The injections consist of a local anesthetic and possibly a corticosteroid. Preinjection and postinjection levels of pain are examined, with a notable and immediate decrease of pain considered indicative of chondral damage within the hip joint. With this approach, Kivlan et al found that individuals with chondral damage displayed a greater relief of pain compared to their counterparts without chondral damage. This was found to be independent of the presence of extra-articular pathology. The clinician should consider the role of injection therapy in patient management, particularly if improvement in pain is delayed or impacting the ability to restore optimal functioning.

**CLINICAL COURSE**

The clinical course of nonarthritic hip joint disorders has not been described. Femoroacetabular impingement and labral tears are both proposed to contribute to OA. A shallow acetabulum and resulting acetabular dysplasia have been shown to be associated with OA of the hip joint in relatively younger patients. Further research is needed to understand the clinical course of nonarthritic hip joint disorders.

**CLINICAL MANAGEMENT**

The management of nonarthritic hip joint disorders is highly variable. A period of nonsurgical management is recommended, of at least 8 to 12 weeks, prior to consideration of surgical intervention. Nonsurgical management includes physical therapy as well as medication and, later, if indicated, ultrasound/fluoroscopic-guided therapeutic injections. If
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Symptoms do not improve with nonsurgical care, surgical intervention may be considered.

Recent advances in imaging and surgical techniques have led to an increase in surgical management for nonarthritic hip joint disorders. Although evidence related to favorable surgical outcomes is growing, the literature is limited primarily to observational studies with small sample sizes and short-term outcomes. The presence of pathology on imaging in individuals with nonarthritic hip pain, which is refractory to nonsurgical management, needs careful patient selection if surgery is contemplated to optimize the potential for a favorable outcome.

Anti-inflammatory agents are often recommended for pain relief and inflammation; however, evidence to support this intervention in patients with nonarthritic hip pain is lacking. Both over-the-counter and prescribed anti-inflammatory agents, including nonsteroidal anti-inflammatory drugs and COX-2 inhibitors, may be prescribed as part of a treatment program. However, it should be noted that this class of drugs is not without risk for serious adverse events, including increased gastrointestinal bleeding.

Common surgical options include arthroscopic procedures such as labral tear resection or repair, capsular modification, osteoplasty to address femoroacetabular impingement, ligamentum teres tear debridement, and loose-body removal. In addition, a periacetabular osteotomy procedure may be performed to address acetabular dysplasia. The purpose of this open procedure is to surgically separate the acetabulum from the innominate, then reattach the structure in a position that provides ideal coverage of the femoral head, providing closer-to-normal stability of the hip joint.

Of the available arthroscopic procedures, labral tear resection has the most supporting evidence. This procedure is typically utilized for fraying or peripheral tears of the labrum. Studies have shown clinical improvement following labral resection. Intrasubstance tears of the labrum may be repaired. More recently, labral repair in combination with osteoplasty of the acetabular rim and/or the femoral head-neck junction has become a common surgical procedure for treating femoroacetabular impingement and its associated intra-articular abnormalities.

Limited evidence is available to support favorable outcomes in individuals undergoing resection of labral tears combined with capsular modification. An osteoplasty procedure may be performed to remove the excessive bone present in the case of impingement. Early results for this procedure have been promising. A systematic review by Ng et al found that surgical treatment of femoroacetabular impingement reliably improved patients’ symptoms.

Arthroscopic debridement of ligamentum teres tears has been described. The goal of the surgery is to resect the tear to a stable remnant, preventing potential painful disruption of joint mechanics. Promising results have been reported in patients with isolated injury who do not have other concurrent conditions, such as osteochondral defects. Microfracture techniques have been described for medium-size, full-thickness chondral defects. No current studies exist examining the outcomes for microfracture procedures of the hip joint.
OUTCOME MEASURES

Hip Outcome Score

The Hip Outcome Score (HOS) is a self-report measurement tool consisting of 2 separate subscales for activities of daily living (ADL) and sports.116,188,192 The HOS was developed specifically to assess the ability of young individuals with acetabular labral tears and address the ceiling effect of the Harris Hip Score (HHS)23,70 and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC).11 The ADL subscale contains 17 items; examples include walking on level surfaces, hills, stairs, getting in and out of a car, deep squat, heavy work, and recreational activities. The sports subscale contains 9 items; examples include running, jumping, cutting, and swinging a golf club. Each item is scored from 4 to 0, with 4 being “no difficulty” and 0 being “unable to do.” There is a “nonapplicable” option that is not counted in scoring. The total number of items with a response is multiplied by 4 to get the highest potential score. An individual’s score is divided by the highest potential score, then multiplied by 100 to get a percentage. A higher score is representative of a higher level of physical function for each subscale.

The HOS subscales have high test-retest reliability (intraclass correlation coefficient [ICC] = 0.98 and 0.92 for the ADL and sports subscales, respectively).114 The minimal detectable change (MDC) is an increase or decrease of 3 points,114 and the minimal clinically important difference is 9 points on the ADL subscale and 6 points on the sports subscale.

Each subscale of the HOS demonstrated construct validity when compared to the Medical Outcomes Study 36-Item Short-Form Health Survey questionnaire.114 In patients with labral tears, the correlation coefficients between the ADL subscale and the Medical Outcomes Study 36-Item Short-Form Health Survey physical function and physical component scores were 0.76 and 0.74, respectively.116 The correlation coefficients between the sports subscale and the Medical Outcomes Study 36-Item Short-Form Health Survey physical function and physical component scores were 0.72 and 0.68, respectively.205

Copenhagen Hip and Groin Outcome Score

The Copenhagen Hip and Groin Outcome Score (HAGOS)119 was developed in 2011 to assess a patient’s hip and groin disability in a young, active patient. The HAGOS is a disease-specific self-report questionnaire with the following 6 separately scored subscales: pain, other symptoms, physical function in daily living, function in sport and recreation, participation in physical activities, and hip-related quality of life. Each item is scored using standardized answer options ranging from 0 to 4. A normalized score, with 100 indicating no symptoms, is calculated for each subscale.

The HAGOS has substantial test-retest reliability, with ICCs ranging from 0.82 to 0.91 for the 6 subscales.188 The smallest detectable change for the subscales ranges from 2.7 to 5.2, indicating that changes greater than 5.2 in any scale would be detectable.188 Construct validity and responsiveness were confirmed, with statistically significant correlation coefficients from 0.37 to 0.73 (P < .01) for convergent construct validity and, for responsiveness, from 0.56 to 0.69 (P < .01).188

International Hip Outcome Tool

The International Hip Outcome Tool (iHOT-33)132 was developed in 2012 by the Multicenter Arthroscopy of the Hip Outcomes Research Network specifically for young, active adults with symptomatic hip disease. The iHOT-33 is a disease-specific self-report questionnaire with questions related to the following domains: symptoms and functional limitations; sports and recreational physical activities; job-related concerns; and social, emotional, and lifestyle concerns. Each item on the iHOT-33 is scored using a 100-point visual analog scale, where 100 indicates the best possible score.

The iHOT-33 has moderate to good test-retest reliability (ICC = 0.78 for the overall score).132 Convergent construct validity was confirmed, with a statistically significant correlation coefficient of 0.81 compared to the Nonarthritic Hip Score.132 The minimal clinically important difference after hip arthroscopy is 6 points. The properties of the subscales have not been assessed.132

Modified Harris Hip Score

The Modified Harris Hip Score (MHHS)22 is a disease-specific self-report questionnaire with questions related to pain and functional ability. The original HHS,70 developed to assess patient function
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after total hip arthroplasty, was modified by excluding the clinician’s judgment of deformity and range of motion. The modified HHS, therefore, allows the patient to complete the questionnaire independently. A single score is calculated, ranging from 0 to 100, where higher scores indicate better function. Approximately 48% of the modified HHS score is based on the patient’s description of his or her pain, and the remaining 52% is based on the ability to complete basic activities, including walking, stairs, and donning/doffing shoes and socks. The modified HHS does not capture the patient’s ability to perform higher-level tasks, such as heavy work or exercise activities. Although the modified HHS is the most commonly reported outcome measure in the current literature related to patients with nonarthritic hip joint pain, no studies have been reported on the reliability or validity of the measure in nonarthritic hip joint pain.

Western Ontario and McMaster Universities Osteoarthritis Index

The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)\(^1\) is a self-report functional outcome questionnaire. A total score (score range, 0-96) and 3 scale scores representing pain (score range, 0-20), stiffness (score range, 0-8), and physical function (score range, 0-68) are generated. Lower scores represent better health or function. Scores for the scales and the total score may be normalized as a percentage. The WOMAC was originally developed to assess outcomes in patients after a total joint replacement and has limited validity for use in the individual with nonarthritic hip joint disease.\(^2\)\(^3\) A modified version with improved validity has been recently introduced,\(^4\)\(^5\) with further study needed to determine the reliability and responsiveness of the questionnaire.

Hip disability and Osteoarthritis Outcome Score

The Hip disability and Osteoarthritis Outcome Score (HOOS)\(^6\)\(^7\) was introduced in 2003 as a disease-specific self-report questionnaire that could be used for individuals with various types of hip pain. The HOOS includes all questions from the WOMAC, along with additional items thought to be useful in detecting limitations in higher-level activities, such as running, squatting, and pivoting. The current version of the HOOS (version 2) includes 40 items to assess 5 domains: symptoms (stiffness and range of motion), pain, function in daily living, function in sport and recreation, and hip-related quality of life. Each item is scored using standardized answer options scored from 0 to 4. A normalized score, with 100 indicating no symptoms, is calculated for each subscale. The HOOS may be preferred to the WOMAC due to its reduced ceiling effect compared to the WOMAC. Additionally, the WOMAC score can be calculated from the HOOS questionnaire if desired. The HOOS has been shown to have high test-retest reliability\(^8\) and adequate construct validity when used with older individuals\(^9\); however, the psychometric properties of the HOOS in young adults are unknown. Recently, questions from the HOOS have been used to develop the HAGOS, a hip-specific score developed specifically for hip and groin disability in a young, active patient.\(^10\)

Clinicians should use a validated outcome measure, such as the HOS, the HAGOS, or the iHOT-33, before and after interventions intended to alleviate the impairments of body function and structure, activity limitations, and participation restrictions in individuals with nonarthritic hip joint pain.\(^11\)

Physical Impairment Measures

Trendelenburg Sign

- ICF category: measurement of impairment of body function: power of isolated muscles and muscle groups and control of complex voluntary movements.
- Description: the purpose is to assess ability of the hip abductors to stabilize the pelvis during single-limb stance.
- Measurement method\(^12\): from standing, the patient performs single-limb stance by flexing the opposite hip to 30° and holding for 30 seconds. Once balanced, the patient is asked to raise the nonstance pelvis as high as possible. From the posterior view, the examiner observes the angle formed by a line that connects the iliac crest and a line vertical to the testing surface. Observation: the test is negative if the pelvis on the nonstance side can be elevated and maintained for 30 seconds. The test is positive if 1 of the following criteria are met: (1) the patient is unable to hold the elevated pelvic position for 30 seconds, (2) no elevation is noted on the nonstance side, (3) the stance hip adducts, allowing the pelvis on the nonstance side to drop downwardly below the level of the stance-side pelvis. A false negative may occur if the patient is allowed to shift his or her trunk too far laterally over the stance limb. The patient may use light touch with the ipsilateral upper extremity, or the examiner may provide gentle manual pressure to maintain balance and reduce the trunk shift. Objective measurement: a goniometer may be used to quantify the amount of pelvic movement. The axis of the goniometer is placed on the anterior superior iliac spine, the stationary arm along an imaginary line between the 2 anterior superior iliac spine landmarks, and the moving arm along the anterior midline of the femur.\(^13\)

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• Measurement properties: objective measurement: Youdas et al measured intrater reliability in healthy subjects. They reported that the intrater reliability for measurement of the hip adduction angle was 0.58 and standard error of measurement (SEM) was 2°. The MDC was 4°.

Hip Flexion, Abduction, External Rotation (FABER) Test
• ICF category: measurement of impairment of body function: pain in joints and mobility of a single joint
• Description: a test to determine the movement/pain relation (irritability) of hip movements and mobility at the hip joint
• Measurement method: position and motion: the patient is positioned in supine, with the heel of the lower extremity to be tested placed over the opposite knee. The hip joint is passively externally rotated and abducted while stabilizing the contralateral anterior superior iliac spine. The patient is asked what effect the motion has on symptoms. The test is considered positive if the patient reports the production of, or increase in, the anterior groin, posterior buttock, or lateral hip pain, which is consistent with the patient’s presenting pain complaint. If no increase in pain is produced, pressure may be placed over the ipsilateral knee to determine the limit/endpoint for range of passive motion and to again assess for pain provocation. Measurement: after being zeroed against a wall, the inclinometer is placed on the medial aspect of the tibia of the tested lower extremity, just distal to the medial tibial condyle. The range-of-motion measurement is taken at the point of maximal passive resistance or at the point where the patient stopped the test secondary to pain. Provocation: a positive test for hip pathology reproduces groin pain. Range of motion: side-to-side comparison is made.
• Nature of variable: (1) provocation: nominal; (2) range of motion: continuous
• Units of measurement: (1) provocation: none; (2) range of motion: degrees
• Measurement properties: specific to pathology or pain relief: Martin and Sekiya assessed the intertester reliability of the FABER test in people seeking care for intra-articular, nonarthritic hip joint pain. The examiners demonstrated 84% agreement and a kappa value of 0.63 (95% confidence interval [CI]: 0.43, 0.83), indicating substantial reliability. In a separate study, Martin et al assessed the diagnostic accuracy of the FABER test. Using pain relief with a diagnostic injection as the comparison, the sensitivity and specificity of the FABER test were reported to be 0.60 (95% CI: 0.41, 0.77) and 0.18 (95% CI: 0.07, 0.39), respectively. The positive likelihood ratio was 0.73 (95% CI: 0.50, 1.1) and the negative likelihood ratio was 2.2 (95% CI: 0.8, 6). In their study to detect intra-articular hip pathology, including OA, Maslowski et al also assessed the diagnostic accuracy of the FABER test. Using pain relief with a diagnostic injection as the comparison, the sensitivity and specificity of the FABER test were reported to be 0.82 (95% CI: 0.57, 0.96) and 0.25 (95% CI: 0.09, 0.48), respectively. The positive predictive value was 0.46 (95% CI: 0.28, 0.65) and the negative predictive value was 0.64 (95% CI: 0.27, 0.91). Mitchell et al reported a slightly higher sensitivity (88%) when compared to intraoperative findings; however, there was no correlation to a specific hip joint pathology, such as labral or chondral lesions. Specific to range of motion: no studies were located reporting the measurement properties of the FABER for range of motion in people with nonarthritic hip joint pain. In a study of people with knee OA, Cliborne et al reported the reliability of range-of-motion measurements to be excellent (ICC = 0.87; 95% CI: 0.78, 0.94).

Hip Flexion, Adduction, Internal Rotation (FADIR) Impingement Test
• ICF category: measurement of impairment of body function: pain in joints and mobility of a single joint
• Description: a test to assess for painful impingement between the femoral neck and acetabulum in the anterosuperior region. The FADIR test has also been used to assess for specific pathology of the acetabular labrum
• Measurement method: the patient is positioned in supine. The hip and knee are flexed to 90°. Maintaining the hip at 90° of flexion, the hip is then internally rotated and adducted as far as possible. The patient is asked what effect the motion has on symptoms. The test is considered positive if the patient reports a production of, or increase in, the anterior groin, posterior buttock, or lateral hip pain consistent with the patient’s presenting pain complaint. If the test is negative, the test is repeated with the hip placed in full flexion.
• Nature of variable: nominal (positive/negative)
• Units of measurement: none
• Measurement properties: Martin and Sekiya assessed the intertester reliability of the FADIR test in people seeking care for intra-articular, nonarthritic hip joint pain. The examiners demonstrated 91% agreement; however, due to the high proportion of positive to negative test agreements, the kappa value was low at 0.58 (95% CI: 0.29, 0.87), indicating only moderate reliability. Specific to pathology or pain relief: 2 studies reported the FADIR test characteristics specific to pain provocation. In both studies, the subjects were patients who reported pain consistent with intra-articular, nonarthritic hip joint pain. Compared to diagnostic injection, the sensitivity and specificity of the FADIR test were reported to be 0.78 (95% CI: 0.59, 0.89) and 0.10 (95% CI: 0.03, 0.29), respectively. The positive likelihood ratio was 0.86 (95% CI: 0.67, 1.1) and the nega-
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• Measurement method:
  - Hip internal and external rotation in 90° of flexion: position and motion: the patient is positioned sitting with the hip at 90° of flexion. The hip measured is placed in 0° of abduction, and the contralateral hip is placed in about 30° of abduction. The reference knee is flexed to 90°, and the leg is passively moved to produce hip rotation. The sitting position assists to stabilize the pelvis, and the pelvis should be closely monitored to avoid pelvic movement. The tibiofemoral joint must also be controlled to prevent motion (rotation or abduction/adduction), which could be construed as hip rotation. The motion is stopped when the clinician reaches a firm end feel or when pelvic movement is necessary for additional movement of the limb. Measurement: the measurement may be taken with an inclinometer or a goniometer. The inclinometer is aligned vertically and along the shaft of the tibia, just proximal to the medial malleolus, for both internal and external rotation range of motion. The axis of the goniometer is placed on the anterior aspect of the patella, the stationary arm is placed vertically so it is perpendicular to the supporting surface, and the movement arm is placed along the anterior midline of the lower leg.
  - Hip internal and external rotation in 0° of flexion: position and motion: the patient is positioned prone with feet over the edge of the treatment table. The hip being measured is placed in 0° of abduction, and the contralateral hip is placed in about 30° of abduction. The reference knee is flexed to 90°, and the leg is passively moved to produce hip rotation. Manual stabilization is applied to the pelvis to prevent pelvic movement and also at the tibiofemoral joint to prevent motion (rotation or abduction/adduction), which could be construed as hip rotation. The motion is stopped when the clinician reaches a firm end feel or when pelvic movement is necessary for additional movement of the limb. Measurement: the measurement may be taken with an inclinometer or a goniometer. The inclinometer is aligned vertically and along the shaft of the tibia, just proximal to the medial malleolus, for both internal and external rotation range of motion. The axis of the goniometer is placed on the anterior aspect of the patella, the stationary arm is placed vertically so it is perpendicular to the supporting surface, and the movement arm is placed along the anterior midline of the lower leg.

Log-Roll Test
  • ICF category: measurement of impairment of body structure: fasciae and ligaments of the hip
  • Description: a test to determine ligamentous laxity
  • Measurement method: the patient is positioned in supine with the hip and knee in 0° of extension. The hip is passively rotated internally and externally. The examiner ensures the rotation is occurring at the hip and not at the knee or ankle. The examiner notes any side-to-side difference in external rotation range of motion. The test is positive for ligamentous laxity when the involved hip demonstrates greater external rotation range of motion than the unininvolved hip.
  • Nature of variable: nominal
  • Units of measurement: none
  • Measurement properties: Martin and Sekiya assessed the intertester reliability of the log-roll test in people seeking care for intra-articular, nonarthritic hip joint pain. The examiners demonstrated 80% agreement and a kappa value of 0.61 (95% CI: 0.48, 0.84), indicating substantial reliability.

Passive Hip Internal and External Rotation
  • ICF category: measurement of impairment of body function: mobility of a single joint and pain in joints
  • Description: the amount of hip rotation range of motion measured with the hip in 90° of flexion (sitting) and 0° of flexion (prone). The patient is also asked to rate the amount of pain experienced during the movement on a 0-to-10 numeric pain rating scale (NPRS)
  • Measurement method: degrees, 0-to-10 NPRS
    - Hip internal and external rotation in 90° of flexion: position and motion: the patient is positioned sitting with the hip at 90° of flexion. The hip measured is placed in 0° of abduction, and the contralateral hip is placed in about 30° of abduction. The reference knee is flexed to 90°, and the leg is passively moved to produce hip rotation. The sitting position assists to stabilize the pelvis, and the pelvis should be closely monitored to avoid pelvic movement. The tibiofemoral joint must also be controlled to prevent motion (rotation or abduction/adduction), which could be construed as hip rotation. The motion is stopped when the clinician reaches a firm end feel or when pelvic movement is necessary for additional movement of the limb. Measurement: the measurement may be taken with an inclinometer or a goniometer. The inclinometer is aligned vertically and along the shaft of the tibia, just proximal to the medial malleolus, for both internal and external rotation range of motion. The axis of the goniometer is placed on the anterior aspect of the patella, the stationary arm is placed vertically so it is perpendicular to the supporting surface, and the movement arm is placed along the anterior midline of the lower leg.
Passive Hip Flexion and Passive Hip Abduction

- ICF category: measurement of impairment of body function: mobility of a single joint and pain in joints
- Description: measurement of the amount of passive hip flexion and hip abduction range of motion. The patient is also asked to rate the amount of pain experienced during the movement on a 0-to-10 NPRS
- Measurement method:
  - Hip flexion: position and motion: the patient is in the supine position and the hip in 0° of abduction, adduction, and rotation. With the knee flexed, the hip is passively flexed while the lumbar spine is monitored to avoid posterior pelvic tilt. The motion is stopped when the clinician reaches a firm end feel or when pelvic movement is necessary for additional movement of the limb. Measurement: the axis of the goniometer is placed at the greater trochanter, the stationary arm is placed along the midline of the pelvis, and the moving arm along the midline of the femur.
  - Hip abduction: position and motion: the patient is positioned in supine with the hip in 0° of flexion and rotation. With the knee extended, the hip is passively abducted. Manual stabilization is provided at the pelvis to prevent lateral pelvic tilt or pelvic rotation. The motion is stopped when the clinician reaches a firm end feel or when pelvic movement is necessary for additional movement of the limb. Measurement: the axis of the goniometer is placed on the anterior superior iliac spine of the tested side, the stationary arm along an imaginary line between the 2 anterior superior iliac spine landmarks, and the moving arm along the anterior midline of the femur.
  - Nature of variable: continuous (range of motion), ordinal (pain)
  - Units of measurement: degrees, 0-to-10 NPRS
  - Measurement properties: there are no known studies reporting the measurement properties of hip range of motion in individuals with nonarthritic hip joint pain. Studies reporting tester reliability in healthy adults and individuals with other musculoskeletal pain provide evidence of excellent intrarater reliability of hip rotation range-of-motion measurements. Ellison et al\textsuperscript{33} reported ICCs for hip internal and external rotation ranging from 0.96 to 0.99 in healthy individuals and 0.95 to 0.97 in people with low back pain. In patients with hip OA, Pua et al\textsuperscript{189} reported ICCs of 0.93 (95% CI: 0.83, 0.97; SEM, 3.4°) and 0.96 (95% CI: 0.91, 0.99; SEM, 3.1°) for internal and external rotation, respectively. The clinically important difference for the NPRS, derived from patients with low back pain, has been shown to be a reduction of 2 points.\textsuperscript{28,31}

Hip Abductor Muscle and Posterior Gluteus Medius Strength Test

- ICF category: measurement of impairment of body function: power of isolated muscles and muscle groups
- Description: a test to determine the strength of the hip abductor muscles
- Measurement method:
  - Hip abductor strength: hip abductor strength is measured with the patient in sidelying on the non-tested side. The patient is positioned with the trunk in neutral alignment and the pelvis perpendicular to the testing surface. The non-tested hip and knee are flexed. The patient's tested limb is placed in hip abduction, neutral rotation, and neutral flexion/extension. The examiner then monitors for compensation as the patient holds the test position. If the patient can maintain the test position for 3 seconds without compensation, resistance may be applied. The examiner places 1 hand on the iliac crest to prevent the pelvis from rotating or tilting. Measurement: manual muscle test: the examiner uses the other hand to place resistance at the ankle in the direction of femoral adduction. A grade between 0 and 5 is given based on the patient's ability to move or hold the limb against gravity or to resist additional manual force provided by the clinician. Handheld dynamometer: the examiner places the dynamometer at the lateral aspect of the distal thigh. A "make" test\textsuperscript{33} is performed by asking the participant to push maximally against the dynamometer, simulating their maximum isometric contraction. To eliminate the effect of tester strength,\textsuperscript{186} it is best to perform the "make" test using straps to hold the dynamometer in place and to provide the resistance to the motion. A "break" test\textsuperscript{33} is performed by the tester manually applying the resistance. The participant is asked to hold against the examiner's resistance. Maximum strength is assumed when the tester's force is able to overcome the participant's force. Using the dynamometer, force may be expressed as pounds, kilograms, or Newtons. The test may also be performed in supine.
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- Posterior gluteus medius strength: posterior gluteus medius strength is measured with the patient in sidelying on the nontested side. The patient is positioned with the trunk in neutral alignment and the pelvis rotated slightly forward. The nontested hip and knee are flexed. The patient’s tested limb is placed in hip abduction, slight external rotation, and slight extension. The examiner monitors for compensation as the patient holds the test position. If the patient can maintain the test position for 3 seconds without compensation, resistance may be applied. The examiner firmly places 1 hand on the iliac crest to prevent the pelvis from rotating or tilting. Measurement: manual muscle test: the examiner uses the other hand to place resistance at the ankle in the direction of femoral adduction and flexion. A grade between 0 and 5 is given based on the patient’s ability to move or hold the limb against gravity or to resist additional manual force provided by the clinician. Handheld dynamometer: the examiner places the dynamometer at the lateral aspect of the distal thigh. A “make” test is performed by asking the participant to push maximally against the dynamometer, simulating their maximum isometric contraction. To eliminate the effect of tester strength, it is best to perform the “make” test using straps to hold the dynamometer in place and to provide the resistance to the motion. A “break” test is performed by the tester manually applying the resistance. The participant is asked to hold against the examiner’s resistance. Maximum strength is assumed when the tester’s force is able to overcome the participant’s force. Using the dynamometer, force may be expressed as pounds, kilograms, or Newtons.

  • Nature of variable: manual muscle test: ordinal. Dynamometer: continuous
  • Units of measurement: manual muscle test: none. Dynamometer: force in pounds, kilograms, or Newtons
  • Measurement properties: there are no known studies reporting the measurement properties of hip abductor or posterior gluteus medius strength testing in people with nonarthritic hip disorders. Studies reporting tester reliability in healthy adults and people with hip OA provide evidence of good to excellent intrarater reliability for testing the hip abductors. Hip abductors in the sidelying position using handheld dynamometer: the intrarater reliability (ICC) of force measures in healthy subjects was 0.90 (95% CI: 0.74, 0.97). The coefficient of variation was 3.67%. Hip abductors in the supine position using handheld dynamometer: the intrarater reliability (ICC) of force measures in healthy subjects was 0.83 (95% CI: 0.57, 0.94) to 0.96. The coefficient of variation was 6.11%. The MDC20 determined from a sample of healthy subjects was 5.4% of body weight for males and 5.3% of body weight for females. In subjects with hip OA, the intrarater reliability (ICC) for hip abductor muscle torque was 0.84 (95% CI: 0.55, 0.94; SEM, 12.1 Nm).

Hip Internal Rotator Muscle Strength Test With the Hip Flexed and the Hip Extended

  • ICF category: measurement of impairment of body function: power of isolated muscles and muscle groups
  • Description: a test to determine the strength of the hip internal rotator muscles
  • Measurement method: hip internal rotators, hip flexed: the internal rotators are measured with the patient in sitting, with the knees flexed to 90°. The patient is positioned with the trunk in neutral alignment and the hip in 90° of flexion and 0° of abduction/adduction. Hip extended: the internal rotators are measured with the patient in supine, with the knee flexed to 90° over the edge of the testing surface. The patient is positioned with the trunk in neutral alignment and the hip in 0° of flexion/extension and 0° of abduction/adduction. To assist in maintaining the trunk in neutral alignment, the opposite hip and knee are placed in flexion with the foot resting on the support surface. The patient’s tested limb is placed at end-range internal rotation. The examiner then monitors for compensation as the patient holds the test position. If the patient can maintain the test position for 3 seconds without compensation, resistance may be applied. The examiner places one hand on the medial distal thigh to prevent hip abduction/adduction. Measurement: manual muscle test: the examiner uses the other hand to place resistance at the ankle in the direction of external rotation. A grade between 0 and 5 is given based on the patient’s ability to move or hold the limb against gravity or to resist additional manual force provided by the clinician. Handheld dynamometer: the examiner places the dynamometer above the ankle on the lateral aspect. A “make” test is performed by asking the participant to push maximally against the dynamometer, simulating their maximum isometric contraction. To eliminate the effect of tester strength, it is best to perform the “make” test using straps to hold the dynamometer in place and to provide the resistance to the motion. A “break” test is performed by the tester manually applying the resistance. The participant is asked to hold against the examiner’s resistance. Maximum strength is assumed when the tester’s force is able to overcome the participant’s force. Using the dynamometer, force may be expressed as pounds, kilograms, or Newtons.

  • Nature of variable: manual muscle test: ordinal. Dynamometer: continuous
  • Units of measurement: manual muscle test: none. Dynamometer: force in pounds, kilograms, or Newtons
  • Measurement properties: there are no known studies reporting the measurement properties of hip internal rotator strength testing in people with nonarthritic hip disorders.
Hip internal rotation with the hip flexed: in subjects with hip OA, the intratester reliability (ICC\textsubscript{2,2}) for hip internal rotator muscle torque (force in Newtons × lever arm) was 0.98 (95% CI: 0.96, 0.99; SEM, 3.2 Nm).\textsuperscript{159}

**Hip External Rotator Muscle Strength Test With the Hip Flexed and the Hip Extended**

- **ICF category**: measurement of impairment of body function: power of isolated muscles and muscle groups
- **Description**: a test to determine the strength of the hip external rotator muscles
- **Measurement method**: hip external rotators, hip flexed\textsuperscript{159}: the external rotators are measured with the patient in sitting, with the knees flexed to 90°. The patient is positioned with the trunk in neutral alignment and the hip in 90° of flexion and 0° of abduction/adduction. Hip extended: the external rotators are measured with the patient in supine, with the knee flexed to 90° over the edge of the testing surface. The patient is positioned with the trunk in neutral alignment and the hip in 0° of flexion/extension and 0° of abduction/adduction. To assist in maintaining the trunk in neutral alignment, the opposite hip and knee are placed in flexion with the foot resting on the support surface. The patient’s tested limb is placed at end-range external rotation. The examiner then monitors for compensation as the patient holds the test position. If the patient can maintain the test position for 3 seconds without compensation, resistance may be applied. The examiner places one hand on the lateral distal thigh to prevent hip abduction/adduction. Measurement: manual muscle test: the examiner uses the other hand to place resistance at the ankle in the direction of internal rotation. A grade between 0 and 5 is given based on the patient’s ability to move or hold the limb against gravity or to resist additional manual force provided by the clinician. Handheld dynamometer: the examiner places the dynamometer just proximal to the knee on the extensor surface of the thigh. A “make” test\textsuperscript{157} is performed by asking the participant to push maximally against the dynamometer, simulating their maximum isometric contraction. To eliminate the effect of tester strength,\textsuperscript{160} it is best to perform the “make” test using straps to hold the dynamometer in place and to provide the resistance to the motion. A “break” test\textsuperscript{158} is performed by the tester manually applying the resistance. The participant is asked to hold against the examiner’s resistance. Maximum strength is assumed when the tester’s force is able to overcome the participant’s force. Using the dynamometer, force may be expressed as pounds, kilograms, or Newtons.
- **Nature of variable**: manual muscle test: ordinal. Dynamometer: continuous
- **Units of measurement**: manual muscle test: none. Dynamometer: force in pounds, kilograms, or Newtons
- **Measurement properties**: there are no known studies reporting the measurement properties of hip external rotator strength testing in people with nonarthritic hip disorders.

**Single-Joint Hip Flexor Muscle Strength Test**

- **ICF category**: measurement of impairment of body function: power of isolated muscles and muscle groups
- **Description**: a test to determine the strength of the hip flexor muscles
- **Measurement method**: the hip flexors are measured with the patient in sitting, with the knee flexed to 90° over the edge of the testing surface. The patient is positioned with the trunk in neutral alignment and the hip in 0° of external/internal rotation and 0° of abduction/adduction. The patient’s tested limb is placed at end-range flexion. The examiner then monitors for compensation as the patient holds the test position. If the patient can maintain the test position for 3 seconds without compensation, resistance may be applied. The examiner places one hand on the anterior shoulder to prevent trunk flexion. Measurement: manual muscle test: the examiner uses the other hand to place resistance at the anterior distal femur in the direction of hip extension. A grade between 0 and 5 is given based on the patient’s ability to move or hold the limb against gravity or to resist additional manual force provided by the clinician. Handheld dynamometer: the examiner places the dynamometer above the ankle on the lateral aspect. A “make” test\textsuperscript{157} is performed by asking the participant to push maximally against the dynamometer, simulating their maximum isometric contraction. To eliminate the effect of tester strength,\textsuperscript{160} it is best to perform the “make” test using straps to hold the dynamometer in place and to provide the resistance to the motion. A “break” test\textsuperscript{158} is performed by the tester manually applying the resistance. The participant is asked to hold against the examiner’s resistance. Maximum strength is assumed when the tester’s force is able to overcome the participant’s force. Using the dynamometer, force may be expressed as pounds, kilograms, or Newtons.
- **Nature of variable**: manual muscle test: ordinal. Dynamometer: continuous
- **Units of measurement**: manual muscle test: none. Dynamometer: force in pounds, kilograms, or Newtons
- **Measurement properties**: there are no known studies reporting the measurement properties of hip flexor strength in people with nonarthritic hip disorders. Hip flexion with the handheld dynamometer: in subjects with hip OA, the intratester reliability (ICC\textsubscript{2,2}) for hip flexor muscle torque (force in Newtons × lever arm) was 0.87 (95% CI: 0.69, 0.95; SEM, 10.9 Nm).\textsuperscript{159}
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Interventions

These guidelines will address the major nonsurgical interventions of nonarthritic hip joint disorders. Because the available evidence examining nonsurgical management of individuals with nonarthritic hip pain is limited, all of the interventions discussed in these guidelines are based on expert opinion. Clinicians should consider a course of conservative management as the initial treatment approach for this population.

PATIENT EDUCATION AND COUNSELING

Griffin et al. described the importance of preoperative physical therapy for patients preparing to undergo arthroscopic procedures of the hip joint. Patients may be provided education in regard to joint protection strategies and avoidance of symptom-provoking activities. Individuals with an acetabular labral tear should be educated in regard to activities that could place the labrum at risk for further injury. Advice on activity modifications is indicated for all individuals with nonarthritic hip disorders and should be individually tailored to meet the functional demands and the diagnostic subgroup unique to the individual. Education recommendations based on the presence of specific osseous abnormalities are listed below.

DIAGNOSIS – SPECIFIC INSTRUCTION

Femoroacetabular Impingement

The patient should avoid activities that consistently place the hip joint in positions that create the impingement effect. Activities that place the hip joint in end-range flexion, internal rotation, and in some cases abduction are of particular concern.\(^{53,56,8}\)

Structural Instability

Activities that place repetitive strain on the passive restraints of the hip should be limited. Such activities may include the motions of forced extension or rotational loading.

Activity Modification

Daily activities such as sitting, sit-to-stand, ambulation on level surfaces and stairs, and sleeping positions should be assessed to determine whether the patient is able to perform these activities without an increase in pain. The movement pattern and alignment of the hip demonstrated during the activities should be assessed to determine whether the movement pattern or alignment may be contributing to the pain problem.\(^{102,108}\) If the movement pattern or alignment appears to be contributing to the pain problem, then instruction should be provided to modify the patient’s performance. For example, a patient with a positive hip flexion, adduction, internal rotation (FADIR) test should be instructed to avoid assuming positions that place the hip in the impingement position, such as sitting in a low, soft chair. Sitting in a low, soft chair may place the hip in a flexed and internally rotated position and therefore contribute to impingement-related pain.

If pain is increased or the patient demonstrates a significant impaired movement pattern during ambulation, he or she may need to be instructed in the use of assistive devices, such as a walker, crutches, or a cane. Assistive devices, when used appropriately, will reduce the amount of force through the hip joint. When using a cane, the cane should be placed in the hand opposite the injured limb. Also, instructing patients in gait modification by emphasizing ankle and toe plantar flexion at the terminal stance and preswing phases of the gait cycle may be helpful.\(^{107}\)

In addition to basic daily activities, activities that increase the patient’s pain, such as work-related or fitness activities, should be assessed and modified as appropriate. The activity may be modified by changing the patient’s movement or alignment, such as their sitting position at work, or by reducing the intensity of the activity. For instance, if the patient has femoroacetabular impingement, the flexibility routine may need to be modified to limit the use of aggressive end-range flexion or internal rotation stretches.

Any modifications of the physical environment that can decrease the overall amount of repetitive shear forces experienced at the hip joint should be made if feasible. As an example, a patient with femoroacetabular impingement may be instructed to use a higher seat position during work or fitness activities such as cycling. The higher seat position will result in the hips being positioned higher than the knees, and thus excessive hip flexion will be avoided.

Evaluation from a modern pain sciences perspective and patient education from a therapeutic neuroscience approach should be considered. As in OA pain, the exact cause of nonarthritic hip pain is unclear, and there may be changes...
Clinicians may utilize patient education and counseling for modifying aggravating factors and managing pain associated with nonarthritic hip joint pain.

Manual Therapy
A progressive trial of manual therapy, which may include soft tissue or joint mobilization/manipulation, may be beneficial in pain reduction and restoration of motion. Utilization of manual therapy in an attempt to improve the rate of nutrient imbibition for the articular cartilage has been suggested. indications for mobilization/manipulation of the hip joint include hip pain and decreased passive range of motion with a capsular end feel. Indications for mobilization of the pelvis and hip soft tissue, such as myofascia that may be limiting normal hip mobility, include decreased passive range of motion with an elastic end feel and immediate positive gains in mobility following application of procedures to inhibit or relax the targeted myofascia.

Individuals with identified osseous abnormalities may be subject to specific concerns in regard to manual therapy.

Femoroacetabular Impingement
End-range physiologic techniques such as flexion and internal rotation should be avoided if the patient has cam or pincer impingement. Impingement may be suspected if a bony end feel is detected at the end of hip flexion and internal rotation.

Structural Instability
Joint mobilization, except for pain modulation, is contraindicated in individuals classified as hypermobile.

In the absence of contraindications, joint mobilization procedures may be indicated when capsular restrictions are suspected to impair hip mobility, and soft tissue mobilization procedures may be indicated when muscles and their related fascia are suspected to impair hip mobility.

Therapeutic Exercises and Activities

Stretching
The clinician must evaluate patients to determine hip range of motion and assess the range of motion end feel to verify the likely cause of the range-of-motion limitation. Patients who display a limited range of motion with a hard (bony) end feel may not benefit from stretching, particularly if stretching aggravates the patient’s pain. Patients who display a limited range of motion and a capsular end feel may benefit from stretching.

Two patterns of asymmetrical hip rotation may be found in patients with nonarthritic hip pain, including those with excessive hip external rotation with limited hip internal rotation and those with excessive hip internal rotation with limited hip external rotation. These asymmetries may be related to bony abnormalities or soft tissue restrictions. Impingement (cam or pincer) or femoral retroversion may be correlated with reduced hip internal rotation. Excessive femoral anteversion may be correlated with reduced external rotation. The evidence related to contributors to range-of-motion asymmetries due to soft tissue restrictions is limited.

A common pattern in patients with femoroacetabular impingement is where hip internal rotation is decreased while external rotation is increased. noted that adult patients (mean age, 35 years) with signs of hip impingement often have more hip external than internal rotation. noted that patients who present with impingement have limited hip internal rotation. Some studies suggest that a loss of internal rotation in patients with impingement is associated with a bony restriction and is not from a shortening of soft (capsular or muscle) tissue. found that patients with a bony block often had significantly limited hip internal rotation, usually less than 10°. Besides limited hip internal rotation, another finding in patients with femoroacetabular impingement is reduced hip flexion and abduction.

Stretching is contraindicated in those with structural instability, where patients often display an increased range of internal and external hip rotation as well as hip adduction and abduction.

We encourage future studies that will examine the effect of stretching/mobilization on hip joint range of motion in those with limited hip motion or asymmetrical hip rotation and in patients with signs and symptoms of femoroacetabular impingement.

Strengthening
Strength impairments of the lower extremity and trunk identified through physical examination should be addressed. showed that those who have excessive hip external rotation range of motion when compared to internal range of motion have weakness in their hip in-
ternal rotator muscles, whereas those who display excessive hip internal rotation range of motion compared to external rotation range of motion have weakness in the hip external rotator muscles. We recommend that any asymmetrical muscle weakness found in these patients should be addressed with a hip-strengthening program for the specific weakened muscles.

Particular attention should be placed on the strength of the hip abductors and hip rotators in patients with structural instability. It has been suggested that loss of rotational stability may be linked to acetabular labral tears. Sufficient strength may be a particular concern in this population, reducing the ability to control the excessive range of motion that occurs at the hip joint.

**Muscle Flexibility**

Soft tissue restrictions of the lower extremity and trunk can be addressed through soft tissue mobilization, contract/relax stretching, and prolonged stretching that does not increase the patient’s symptoms. Decreased motion secondary to soft tissue length will have a “muscular” end feel as compared to a “hard” end feel due to bony approximation. The most common shortened muscles around the hip include the 2-joint muscles, iliopsoas, rectus femoris, hamstrings, and tensor fascia latae-iliotibial band. Osseous conditions associated with range-of-motion limitations, such as femoroacetabular impingement, femoral retroversion, or excessive femoral anteversion, should not be treated with excessive flexibility exercises, as this may exacerbate symptoms.

**Cardiorespiratory Endurance**

Individuals with nonarthritic hip joint pain may be deconditioned secondary to decreased activity levels due to pain. Cardiorespiratory/aerobic conditioning is necessary to promote optimal health and prevent or remediate metabolic disorders such as obesity and diabetes. Activities that minimize shearing/frictional forces experienced at the hip joint are optimal. In addition, activities that increase pain should be modified. Activities that enable aerobic conditioning with limited stress to the hip include stationary cycling, swimming, and use of elliptical exercise equipment.

Clinicians may utilize therapeutic exercises and activities to address joint mobility, muscle flexibility, muscle strength, muscle power deficits, deconditioning, and metabolic disorders identified during the physical examination of patients with nonarthritic hip joint pain.

**Neuromuscular Re-education**

Neuromuscular re-education, including proprioceptive/perturbation training, has been previously defined as “movement training progressions that facilitate the development of multijoint neuromuscular engrams that combine joint stabilization, acceleration, deceleration, and kinesthesia through intermittent protocols that progress from low intensity movements focused in a single plane to multiplanar power training.” Neuromuscular re-education has had some success for other lower extremity disorders and may provide an effective intervention in nonarthritic hip pain. Kim and Azuma suggested that nerve endings located within the acetabular labrum potentially have an effect on proprioception. Individuals with a compromised labrum may benefit from training to increase the efficiency of the musculature to provide dynamic stabilization.

Clinicians may utilize neuromuscular re-education procedures to diminish movement coordination impairments identified in patients with nonarthritic hip joint pain.
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Summary of Recommendations

**RISK FACTORS**
Clinicians should consider the presence of osseous abnormalities, local or global ligamentous laxity, connective tissue disorders, and nature of the patient’s activity and participation as risk factors for hip joint pathology.

**DIAGNOSIS/CLASSIFICATION – NONARTHRITIC HIP JOINT PAIN**
Clinicians should use the clinical findings of anterior groin or lateral hip pain or generalized hip joint pain that is reproduced with the hip flexion, adduction, internal rotation (FADIR) test or the hip flexion, abduction, external rotation (FABER) test, along with consistent imaging findings, to classify a patient with hip pain into the International Statistical Classification of Diseases and Related Health Problems (ICD) categories of M25.5 Pain in joint, M24.7 Protrusio acetabula, M24.0 Loose body in joint, and M24.2 Disorder of ligament, and the associated International Classification of Functioning, Disability and Health (ICF) impairment-based categories of hip pain (b28016 Pain in joints) and mobility impairments (b7100 Mobility of a single joint: b7150 Stability of a single joint).

**DIFFERENTIAL DIAGNOSIS**
Clinicians should consider diagnostic categories other than non-arthritic joint pain 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 impairments of body function.

**EXAMINATION – OUTCOME MEASURES**
Clinicians should use a validated outcome measure, such as the Hip Outcome Score (HOS), the Copenhagen Hip and Groin Outcome Score (HAGOS), or the International Hip Outcome Tool (iHOT-33), before and after interventions intended to alleviate the impairments of body function and structure, activity limitations, and participation restrictions in individuals with nonarthritic hip joint pain.

**EXAMINATION – PHYSICAL IMPAIRMENT MEASURES**
When evaluating patients with suspected or confirmed hip pathology over an episode of care, clinicians should assess impairments of body function, including objective and reproducible measures of hip pain, mobility, muscle power, and movement coordination.

**INTERVENTION – PATIENT EDUCATION AND COUNSELING**
Clinicians may utilize patient education and counseling for modifying aggravating factors and managing pain associated with nonarthritic hip joint pain.

**INTERVENTION – MANUAL THERAPY**
In the absence of contraindications, joint mobilization procedures may be indicated when capsular restrictions are suspected to impair hip mobility, and soft tissue mobilization procedures may be indicated when muscles and their related fascia are suspected to impair hip mobility.

**INTERVENTION – THERAPEUTIC EXERCISES AND ACTIVITIES**
Clinicians may utilize therapeutic exercises and activities to address joint mobility, muscle flexibility, muscle strength, muscle power deficits, deconditioning, and metabolic disorders identified during the physical examination of patients with nonarthritic hip joint pain.

**INTERVENTION – NEUROMUSCULAR RE-EDUCATION**
Clinicians may utilize neuromuscular re-education procedures to diminish movement coordination impairments identified in patients with nonarthritic hip joint pain.
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