

# Evolut Clinical Guideline ~~057-2~~ 2032 for Lower Extremity Computed Tomography (CT)

## Ankle, Foot, Hip, Knee, Leg, Lower Extremity

<b>Guideline <del>or Policy</del> Number:</b> Evolut_CG_057-22032	<b>Applicable Codes</b>	
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<b>Original Date:</b> September 1997	<b>Last Revised Date:</b> June 202 <del>54</del>	<b>Implementation Date:</b> January 202 <del>65</del>

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## STATEMENT

### General Information

- *It is an expectation that all patients receive care/services from a licensed clinician. All appropriate supporting documentation, including recent pertinent office visit notes, laboratory data, and results of any special testing must be provided. If applicable: All prior relevant imaging results and the reason that alternative imaging cannot be performed must be included in the documentation submitted.*
- *Where a specific clinical indication is not directly addressed in this guideline, medical necessity determination will be made based on widely accepted standard of care criteria. These criteria are supported by evidence-based or peer-reviewed sources such as medical literature, societal guidelines and state/national recommendations.*
- *The guideline criteria in the following sections were developed utilizing evidence-based and peer-reviewed resources from medical publications and societal organization guidelines as well as from widely accepted standard of care, best practice recommendations.*

### Purpose

Plain ~~radiographs-X-rays~~ are typically used as the first-line modality for assessment of lower extremity conditions. Computed tomography (CT) is used for evaluation of tumors, metastatic lesions, infection, fractures, and other problems. Magnetic resonance imaging (MRI) is the first-line choice for imaging of many conditions, but CT may be used in these cases if MRI is contraindicated or unable to be performed.

### Special Notes

- Plain ~~radiographs-X-ray~~ must precede CT evaluation unless otherwise indicated
- Some indications are for MRI, CT, or MR or CT Arthrogram (more than one should **NOT** be approved at the same time)
- If a CT Arthrogram fits approvable criteria below, approve as CT
- When specifically indicated below, MRI is usually the preferred study for the evaluation of the extremities and CT is indicated only when MRI is contraindicated or cannot be performed

## INDICATIONS FOR LOWER EXTREMITY CT (ANKLE, FOOT, HIP, KNEE, OR LEG)

### Pre-condition

Plain radiographs must precede CT evaluation unless otherwise indicated.

## Joint or Muscle Lower Extremity Pain <sup>(1,2,3)</sup>

NOTE: Prior completed X-ray showing no clear etiology of joint/extremity pain must precede lower extremity CT evaluation unless otherwise indicated

### Non-specific Lower Extremity Pain <sup>(1,2)</sup>~~(1,2,3)~~

Lower extremity pain with no specific joint identified with MRI contraindicated or cannot be performed AND with prior X-ray showing no clear etiology of joint/extremity pain with any ONE of the following:

- Persistent joint or musculotendinous lower extremity pain unresponsive to ACTIVE Conservative Therapy Conservative Therapy conservative therapy\* (ACT) which includes physical therapy, chiropractic treatments, and/or physician supervised Home Exercise Program (HEP) Home Exercise Program (HEP) of at least four (4) weeks duration within the last 6 months
- With progression or worsening of symptoms during the course of active conservative treatment
- Pediatric patient that is either under the age of 12 years OR cannot comply with the prescribed therapy

### Joint Specific Pain or Suspected Joint Specific Injury <sup>(4)</sup>

In the absence of a positive joint specific orthopedic sign on exam (see list below), advanced imaging is indicated with MRI contraindicated or cannot be performed AND prior X-ray showing no clear etiology for the joint pain with any ONE of the following:

- Persistent joint pain unresponsive to ACTIVE Conservative Therapy Conservative Therapy (ACT) which includes physical therapy, chiropractic treatments, and/or physician supervised Home Exercise Program (HEP) Home Exercise Program (HEP) of at least four (4) weeks duration within the last 6 months
- With progression or worsening of symptoms during the course of active conservative treatment
- Pediatric patient that is either under the age of 12 years OR cannot comply with the prescribed therapy

NOTE: For Bilateral Hip CT requests: When the patient meets hip joint CT criteria for both right and left hip pain (X-ray completed AND persistent pain unresponsive to active conservative

therapy AND MRI contraindicated or cannot be performed) without a positive orthopedic sign, then Pelvis CT (Evolent -CG -2042) is the preferred study.

## ~~**Negative Findings on Orthopedic Exam and after X-Ray Completed**~~

~~NOTE: Does not apply to young children (up to age 12). If MRI contraindicated or cannot be performed or requested as a CT arthrogram.~~

~~conservative treatment\*, within the last 6 months exercise\*\*)~~

## ~~**Joint Specific Provocative Exam Tests and Suspected Injuries Orthopedic Signs <sup>(4)</sup>**~~

~~NOTE: CT is indicated iff MRI contraindicated or cannot be performed OR if the study , or requested as a CT arthrogram~~

~~NOTE: With a positive orthopedic sign from the list below, an initial X-ray is always preferred; however, it is **NOT** required **UNLESS** otherwise specified in **bold** below.~~

~~NOTE: The joint specific exam testing list below is intended to be thorough but cannot possibly be all inclusive. Advanced imaging is indicated for any orthopedic exam test that clearly suggests joint instability~~

~~Joint specific advanced imaging is indicated for any positive orthopedic sign listed below:~~

~~Approvable Orthopedic Test:~~

~~Any test that suggests joint instability requires further imaging (the below list is not all inclusive)~~

### ~~**Ankle <sup>(3-7)</sup>(56)**~~

~~**If MRI contraindicated or cannot be performed;**~~

- ~~● Physical exam demonstrating a positive result for any **ONE** of the following tests:~~

<u>Suspected Injury</u>	<u>Test Name</u>	<u>Description</u>
	<u>Anterior drawer test</u>	<u>Anterior translation of 1 cm or more of the foot while stabilizing the tibia compared to the healthy contralateral ankle</u>
	<u>Cotton Test</u>	<u>Translation of 3-5 mm and/or a palpable click with lateral</u>

<u>Suspected Injury</u>	<u>Test Name</u>	<u>Description</u>
High Ankle		<u>translation of the tibia while stabilizing the foot</u>
	Dorsiflexion external rotation stress test	<u>Pain with external rotation stress with the foot in maximal dorsiflexion</u>
	<u>Posterior drawer test</u>	<u>Excessive posterior translation of the foot while stabilizing the tibia compared to the healthy contralateral ankle</u>
	Squeeze Test	<u>Pain with compression of the proximal fibula against the tibia</u>
Achilles Tendon	Palpable partial/complete tendon defect	<u>Direct palpation of an Achilles tendon injury</u>
	Thompson Test	<u>Absence of plantar flexion of the foot with squeezing of the calf</u>

- Positive ankle stress X-rays (a specialized X-ray study that assesses the integrity of the ankle's ligaments and joints)
- ~~Syndesmotic injury (high ankle injury) with tenderness to palpation over the syndesmosis (AITFL— anterior inferior tibiofibular ligament) and any of the following<sup>(7,8)</sup>:~~
  - ~~Positive stress X-rays~~
  - ~~Squeeze test~~
  - ~~Cotton test~~
  - ~~Dorsiflexion external rotation test~~
- ~~Unstable lateral injury to ATFL (anterior talofibular ligament) with suspicion of a possible associated fracture around the ankle or a possible osteochondral injury of the talus and any **ONE** of the following<sup>(9)</sup>:~~
  - ~~Positive stress x-rays~~
  - ~~Positive anterior drawer test with non-diagnostic or inconclusive X-rays~~
  - ~~Positive posterior drawer test with non-diagnostic or inconclusive X-rays~~
- ~~Achilles tendon tear<sup>(10)</sup>~~
  - ~~Thompson test or palpable partial or complete Achilles tendon defect on physical examination~~

## **Knee** <sup>(8–10)</sup>~~(11,12)~~

**If MRI contraindicated or cannot be performed;**

— Physical exam demonstrating a positive result for any **ONE** of the following tests:

•

<u>Suspected Injury</u>	<u>Test Name</u>	<u>Description</u>
Anterior cruciate ligament (ACL) <sup>(11)</sup>	Anterior drawer test	<u>Increased anterior translation of the tibia with the foot stabilized and the knee flexed to 90 degrees</u>
	Lachman's Test	<u>Increased anterior translation of the tibia with the thigh stabilized and the knee flexed to 20-30 degrees</u>
	Pivot shift test	<u>Anterior tibial subluxation with internal rotation and valgus stress to the knee</u>
Meniscus <sup>(12)</sup>	Apley's test	<u>Pain/grinding during axial compression and rotation of the knee</u>
	McMurray's Compression Test	<u>Pain/clicking in the knee with internal and external rotation with extension</u>
	Thessaly Test	<u>Pain/clicking in the knee with internal and/or external rotation while standing only on that leg</u>
Posterior cruciate ligament (PCL)	Posterior Drawer Test	<u>Increased posterior translation of the tibia with the foot stabilized and the knee flexed to 90 degrees</u>
	Posterior tibial sag sign (Godfrey test or step-off test)	<u>The tibia sags posteriorly relative to the femur when the knee is flexed compared to the other/contralateral knee</u>
Medial collateral ligament ( <u>MCL</u> )	Positive valgus stress testing/laxity	<u>Pain or laxity in the knee with medially directed (valgus) pressure</u>
Lateral collateral	Positive <u>v</u> arus stress	<u>Pain or laxity in the knee with laterally directed (varus)</u>

<u>Suspected Injury</u>	<u>Test Name</u>	<u>Description</u>
ligament ( <u>LCL</u> )	testing/laxity	<u>pressure</u>
Patella dislocation	Patellofemoral apprehension test	<u>Pain with lateral pressure on the patella with contraction of the quadriceps and the knee flexed to 30 degrees</u>

- Suspected ACL Rupture - acute knee injury with physical exam limited by pain and swelling **AFTER** initial X-ray completed that does not show a clear etiology with any **ONE** of the following <sup>(13)</sup>:
  - Extreme mechanism of injury (sSuch as twisting, blunt force)
  - Extreme pain with inability to perform physical examination
  - Instability to stand (bear full weight)
  - Audible pop at time of injury
  - Very swollen joint with inability to perform the physical exam
  - Large knee effusion on recent prior X-ray
- Acute mechanical locking of the knee with inability to move the knee (not due to pain or guarding) <sup>(14)</sup>
- Suspected patellar dislocation (acute or recurrent) with X-ray findings compatible with a patellar dislocation (such as lipohemarthrosis (a condition where fat/blood build up in joint often after trauma) or osteochondral fracture) <sup>(15)</sup>

**Positive testing:**

**Based on mechanism of injury, i.e., twisting, blunt force**

**Normal x-ray:**

**OR**

**OR**

**Abnormal x-ray:**

**Radiographic Hip** <sup>(16)</sup>

**If MRI contraindicated or cannot be performed;**

- Physical exam demonstrating a positive result for any ONE of the following tests:

<u>Suspected Injury</u>	<u>Test Name</u>	<u>Description</u>
Femoroacetabular	Anterior impingement sign /	<u>Hip or groin pain with hip flexion,</u>

<u>Suspected Injury</u>	<u>Test Name</u>	<u>Description</u>
impingement (FAI) and/or labral tear	<u>Flexion, Adduction, and Internal Rotation (FADIR) test</u>	<u>adduction, and internal rotation</u>
	Posterior impingement sign	<u>Pain with hip extension and external rotation</u>
<u>Suspected Slipped Capital Femoral Epiphysis (SCFE)</u>	<u>Drehmann sign</u>	<u>The hip remains externally rotated when flexed to 90 degrees and there is pain or inability to internally rotate the hip</u>

- Suspected Femoroacetabular impingement (FAI) (abnormal bone structure in hip joint causing chronic pain) OR suspected labral tear (specific injury to the cartilage rim (labrum) of the hip socket, labral tear can result from chronic FAI) with any ONE of the following <sup>(17,18)</sup>; ~~(18,19,20)~~
  - Symptoms of hip clicking, locking, catching, giving way or instability with a clinical suspicion of FAI / labral tear
  - X-ray findings suggestive of FAI / labral tear (such as cross over sign, pistol grip deformity, alpha angle over 50 degrees)
  - ~~Determine candidacy for hip preservation surgery for known FAI~~
- ~~Posterior Impingement sign (Pain with hip extension and external rotation on exam)~~
  - ~~Persistent hip mechanical symptoms (after initial radiographs completed) including clicking, locking, catching, giving way or hip instability with a clinical suspicion of labral tear and/or radiographic (i.e., ) and suspected labral tear~~
  -
- For Bilateral Hip CT requests when MRI is contraindicated or cannot be performed:
  - When the patient meets the criteria above for a suspected labral tear (with a positive orthopedic sign) then bilateral hip CTs are the preferred studies (NOT Pelvis CT)
  - When Bilateral hip CT arthrograms are requested and otherwise meet guidelines, bilateral hip CTs are the preferred studies (NOT Pelvis CT)

**NOTE:** When the patient meets hip CT guidelines for both the right and left hip pain (X-ray completed AND persistent pain unresponsive to active conservative treatment AND MRI contraindicated or not available) without a positive orthopedic sign, then Pelvis CT (Evolent CG 2042) is the preferred study.

**NOTE:** For evaluation of both hips when the patient meets hip MRI guidelines (x-ray + persistent pain unresponsive to conservative treatment) for both the right and left hip, Evolent Clinical Guideline 2045 for Pelvis MRI (Evolent\_CG\_0372045) is the preferred study.

- ~~Labral tear is suspected and fulfills above criteria, then bilateral hip MRIs are the preferred studies (not Pelvis MRI)~~
- ~~Bilateral hip arthrograms are requested and otherwise meet guidelines, bilateral hip MRIs are the preferred studies (not Pelvis MRI)~~

## Suspected Lower Extremity Tendon Rupture ~~Tendon Rupture~~ (7,19)~~(21,22)~~

High clinical suspicion of a specific tendon rupture with ALL of the following:

- After X-ray completed
- Mechanism of injury (sSuch as excess muscle/tendon load, direct blow, high speed impact event) and/or physical findings (sSuch as palpable defect in quadriceps, patellar tendon rupture on exam) consistent with possible tendon rupture

**and not Listed Above**

based on mechanism of injury and physical findings (i.e., )

## Lower Extremity Trauma

### Suspected Bone Fracture

- Hip and Femur <sup>(20)</sup>~~(23)~~
  - Suspected occult, stress or insufficiency fracture with a negative or ~~non-~~ diagnostic/indeterminate initial X-ray AND MRI is contraindicated or cannot be performed:
    - ~~Approve an immediate CT is indicated if contraindication to MRI or MRI cannot be performed (no follow up X-ray radiographs required)~~
    - ~~\_\_\_\_\_~~
  - Suspicion of a hip fracture in a pregnant patient does **NOT** require an initial X-ray
- Non-hip lower extremity:
  - Suspected occult, stress, or insufficiency fracture <sup>(21)</sup>~~(24)~~ with MRI contraindicated or cannot be performed AND any ONE of the following:
    - X-rays, taken 10-14 days or more after the injury or initial clinical assessment, are negative or indeterminate
    - If the anatomic location of the suspected fracture (such as the navicular bone) puts the patient at high risk for a-developing a complete fracture with active conservative therapy
  - ~~Suspected Lisfranc injury (complex fracture dislocation of the meta-tarsal joint(s) of the foot) AND prior indeterminate or normal X-ray <sup>(22)</sup>~~

o

— **NOTE:** Advanced imaging of the foot (not ankle) is the appropriate study to evaluate a possible Lisfranc injury

~~If at high risk for a complete fracture with conservative therapy (e.g., navicular bone), then immediate CT is warranted~~

- Suspected pathologic fracture on prior X-ray <sup>(21)(24)</sup>
- Concern for impending fracture on prior X-ray <sup>(21)(24)</sup>

— Suspected ~~n~~Nonunion or delayed union as demonstrated by no healing between two sets of ~~X~~x-rays 4 to 8 months or more apart <sup>(23)</sup>

- ~~**NOTE:** CT is the preferred study for the evaluation of nonunion or delayed union.~~ <sup>(25)</sup>

### **Known Bone Fracture**

- Known traumatic fractures on prior imaging with suspected associated ligament or tendon injury

~~Pathologic or concern for impending fracture on x-ray or CT <sup>(24)</sup>—approve immediate CT~~

- ~~Suspected ligamentous/tendon injury with known fractures on x-ray/CT that may require surgery~~

### **Osteochondral Lesions** <sup>(6,9,16,24)</sup> ~~(12,25,26)~~

#### **Defects, Fractures, Osteochondritis Dissecans**

- Clinical suspicion based with completed prior X-ray that is indeterminate or abnormal and any **ONE** of the following:
  - Suspicious mechanism of injury (sSuch as prior twisting type joint injury, repeated joint microtrauma from running/jumping)
  - Suspicious physical findings (sSuch as focal pain, decreased range of motion, or joint clicking/catching).

#### **Defects, Fractures, Osteochondritis Dissecans**

~~Clinical suspicion based on mechanism of injury and physical findings~~

~~**NOTE:** X-ray completed~~

### **Joint Prosthesis/Replacement** <sup>(25,26)</sup> ~~(27)~~

- Suspected joint prosthesis complication (such as prosthesis loosening, dysfunction, pseudotumor formation, or osteolysis) with prior X-ray that is indeterminate or abnormal
- Suspected joint prosthesis loosening, infection, or dysfunction, (i.e., pseudotumor formation) after initial x-rays
- Suspected metallosis (increased serum levels of metal ions) with painful metal on metal hip replacement <sup>(27)(28)</sup> after initial X-rays completed and any ONE of the following:
  - After initial x-rays
  - Significantly elevated Cobalt (normal level is less than 1.7 micrograms/liter (ppb)) levels <sup>(28)</sup> and
  - Significantly elevated Chromium (normal level for patients with metallic implants is less than 2.0 micrograms/liter (ppb)) levels <sup>(28)(29)</sup>
    - $\geq 7_{\text{ppb}}$  <sup>(29)</sup>
  - Indeterminate or abnormal joint aspiration (such as findings of metallic debris and absence of infection)

**Note:** Dual-energy CT reduces metal artifact and may be useful in the evaluation of suspected complications after joint replacement

## Lower Extremity Vascular Malformation (VM)

- Vascular malformations of the lower extremity with MRI contraindicated or not available AND any ONE of the following <sup>(29)</sup>: <sup>(34)</sup>
  - After initial evaluation with ultrasound and advanced imaging results will change management
  - Indeterminate or abnormal prior ultrasound
  - Preoperative planning
  - Follow up after prior surgical treatment and/or embolization

**NOTE:** CTA of the lower extremity is also indicated with any of the above conditions

### Extremity Mass<sup>(30)</sup>

~~Mass or lesion after non-diagnostic x-ray or ultrasound. CT is better than MRI to evaluate mass calcification or bone involvement and may complement or replace MRI (MRI is preferred)~~

~~Baker's cyst should be initially evaluated with ultrasound~~

~~Superficial mass, then ultrasound is the initial study~~

~~Deep mass, then x-ray is the initial study~~

~~Vascular malformations<sup>(34)</sup>~~

~~GTA is also approvable for initial evaluation~~

~~Follow up after treatment/embolization~~

~~Known Primary Cancer Malignancy of the Extremity<sup>(32,33,34,35)</sup>~~

- ~~● Initial staging primary extremity tumor~~
- ~~● Follow-up of known primary cancer of patient undergoing active treatment within the past year or as per surveillance imaging guidance for that cancer~~
- ~~● Signs or symptoms or imaging findings suspicious for recurrence~~
- ~~● Suspected metastatic disease with signs/symptoms and after initial imaging with radiographs~~

## **Osteonecrosis**<sup>(30)</sup>~~(36)~~

**When MRI is contraindicated or cannot be performed**

- To further characterize a prior **abnormal X-ray suggesting osteonecrosis**
- Symptomatic and high-risk **patients (sSuch as glucocorticosteroid use, renal transplant, glycogen storage disease, alcohol abuse, sickle cell anemia)** with **normal or indeterminate prior X-ray**
- Known osteonecrosis (**ssuch as avascular necrosis, Legg-Calve-Perthes Disease**) to evaluate the contralateral joint **after** initial X-rays **are abnormal or indeterminate**

~~e.g., **Avascular Necrosis (AVN), Legg-Calve-Perthes Disease**~~

## **Loose Bodies or Synovial Chondromatosis**<sup>(31)</sup>~~(37)~~

- **To evaluate joint pain or mechanical symptoms suspected to be the results of loose bodies and/or chondromatosis (rare, benign condition where multiple cartilaginous nodules form within the synovial lining of a joint) after prior indeterminate or abnormal imaging (X-rRay and /or ultrasound)**

~~After X-Ray or Ultrasound Completed~~

## **Infection / Inflammation**

*In the setting of joint pain or mechanical symptoms*

### ***Infection of Bone, Joint, or Soft Tissue Abscess***<sup>(32)</sup>~~(38)~~

- **Clinical suspicion of infection of the lower extremity with abnormal or indeterminate prior**

X-ray or ultrasound

- Negative prior X-ray or ultrasound but with a clinical suspicion of advanced infection based on any ONE of the following:
  - Signs and symptoms of joint or bone infection such as:
    - Pain and swelling
    - Decreased range of motion
    - Fevers
  - Laboratory findings consistent with possible bone or joint infection such as:
    - Elevated ESR or CRP
    - Elevated white blood cell count
    - Positive joint aspiration
- Lower extremity ulcer (ssuch as diabetic, pressure, ischemic, or traumatic ulcer) with suspected advanced infection with ALL of the following <sup>(33,34)</sup>:
  - Signs of advanced infection on exam (ssuch as redness, warmth, swelling, exposed bone, bone is encountered when probing the wound, worsening breakdown, worsening smell)
  - No improvement despite prior treatment and bone or deep soft tissue infection is now suspected <sup>(40)</sup>
- Neuropathic foot with signs of advanced infection (ssuch as friable or discolored granulation tissue, foul odor, purulent or non-purulent discharge, and delayed wound healing) <sup>((33)40)</sup>
- ~~Abnormal x-ray or ultrasound~~
- ~~either of the following:~~
  - ~~of infection include any of the following:~~
    - ~~\_\_\_\_\_~~
- ~~, pain, discharge which may range from white to serosanguineous) that is not improving~~ <sup>(39)</sup>
  - ~~Increased suspicion if size or temperature increases, bone is exposed/positive probe to bone test, new areas of breakdown, new smell~~

**NOTE:** MRI and nuclear medicine studies are recommended for acute infection as they are more sensitive in detecting early changes of osteomyelitis. CT is better at demonstrating findings of chronic osteomyelitis (sequestra, involucrum, cloaca, sinus tracts) as well as detecting soft tissue gas and foreign bodies.

## Evaluation of Tumor

*When needed for clarification of vascular invasion from tumor after prior imaging.*

## Evaluation of Known or Suspected Autoimmune Disease/Inflammatory (Autoimmune) Joint Disease <sup>(35,36)</sup> ~~(40,41,42)~~

### When MRI is contraindicated or cannot be performed:

- For suspected inflammatory joint disease (sSuch as rheumatoid arthritis, psoriatic arthritis) with any ONE of the following:
  - Prior indeterminate or abnormal imaging
  - Prior normal imaging but with lab test results (sSuch as RF, CRP, ANA, ESR) that suggest autoimmune disease
- For known inflammatory joint disease (sSuch as rheumatoid arthritis, psoriatic arthritis) with any ONE of the following:
  - RecentPrior indeterminate imaging
  - To assess the response to ongoing active medical therapy where prior imaging and/or labs are currently insufficient or have been insufficient in the past
  - To help determine the need to change ongoing active medical therapy based on new/worsening signs or symptoms (such as joint swelling, tenderness, effusion, erythema, warmth, restricted motion, prolonged morning stiffness)

### *Further evaluation of an abnormality or non-diagnostic findings on prior imaging*

- *Initial imaging of a single joint for diagnosis or response to therapy after plain films and appropriate lab tests (e.g., RF, ANA, CRP, ESR)*
- *To determine change in treatment or when diagnosis is uncertain prior to start of treatment*
- *Follow-up to determine treatment efficacy of the following:*
  - *Early rheumatoid arthritis*
  - *Advanced rheumatoid arthritis if x-ray and ultrasound are equivocal or noncontributory*

**e.g., Rheumatoid Arthritis**

## Known or Suspected Inflammatory Myopathies <sup>(37,38)</sup> ~~(43,42)~~

### If MRI is contraindicated or cannot be performed

- For suspected inflammatory myopathy (sSuch as polymyositis, dermatomyositis, immune-mediated necrotizing myopathy, inclusion body myositis) with any ONE of the following:
  - Clinical suspicion based on presenting symptoms (ssuch as symmetric extremity weakness)
  - Clinical suspicion based on lab testing (ssuch as muscle enzyme testing)
  - Clinical suspicion based on prior electromyogram (EMG) results
  - For biopsy planning

- For known inflammatory myopathy (sSuch as polymyositis, dermatomyositis, immune-mediated necrotizing myopathy, inclusion body myositis) with any ONE of the following:
  - Prior indeterminate imaging
  - To assess the response to ongoing active medical therapy where prior imaging and/or labs are or have been insufficient
  - To help determine the need to continue or change ongoing active medical therapy where prior imaging and/or labs are or have been insufficient

## For diagnosis

### Known or Suspected Crystalline Arthropathy <sup>(39,40)</sup>~~(44,43)~~

- ~~Use of Dual-energy CT can be used to characterize~~ Use of Dual-energy CT can be used to characterize crystal deposition disease arthropathy (i.e., gout, calcium pyrophosphate deposition (CPPD)) after:
- ~~Appropriate initial~~ Appropriate initial ~~rheumatological work up (sSuch as serum uric acid, calcium, phosphorus, magnesium levels, joint aspiration) and initial X-rays with any ONE of the following: -AND~~ rheumatological work up (sSuch as serum uric acid, calcium, phosphorus, magnesium levels, joint aspiration) and initial X-rays with any ONE of the following: -AND
  - ~~After inconclusive joint aspiration~~
  - ~~or~~ When joint aspiration cannot be performed -OR
  - In the setting of extra-articular crystal deposits (sSuch as in i.e., tendons, joint or bursa)

### Peripheral Nerve Entrapment <sup>(41,42)</sup>~~(44,45,46)~~

When MRI is contraindicated or cannot be performed; including any of the following:

- For suspected peripheral nerve entrapment (sSuch as Morton's neuroma, tarsal tunnel) with any ONE of the following:
  - Abnormal electromyogram or nerve conduction study
  - Abnormal X-ray or ultrasound
  - Failed prior 4-week inactive conservative therapy including at least two of the following (active conservative therapy is NOT required):
    - Activity modification
    - Rest, ice, and/or heat

- Splinting or orthotics
- Pharmacotherapy (such as NSAIDs, steroids)

○ ~~Clinical suspicion and treatment Medication~~

e.g.,

## Foreign Body <sup>(43)</sup>~~(47,46)~~

- For known or suspected foreign body of the lower extremity with prior imaging that is indeterminate or abnormal

## ~~Indeterminate x-ray and ultrasound~~

## Painful Acquired or Congenital Flatfoot Deformity <sup>(44,45)</sup>~~(47,48,49)~~

- Evaluation of painful acquired flatfoot deformity (pes planus) or suspicion of congenital flatfoot deformity (sSuch as tarsal coalition (abnormal fusion of two or more bones in the midfoot or hindfoot)) with ALL of the following:
  - After prior X-ray completed with no clear etiology for pain
  - Failed prior 4-week trial of inactive conservative therapy including at least two of the following (active conservative therapy is NOT required):
    - Activity modification
    - Rest, ice, and/or heat
    - Splinting or orthotics
    - Pharmacotherapy (such as NSAIDs, steroids)
  - NOTE: Prior X-ray is NOT required for pediatric patients

## Adult

- ~~MRI is contraindicated or cannot be performed~~
- ~~After failure of active conservative therapy~~
  - ~~Medication~~

## Pediatric Specific Indications (Up to Age 18)

○ ~~Osteoid Osteoma – after prior X-ray is indeterminate or abnormal <sup>(46)</sup>~~

●

### When MRI is contraindicated or cannot be performed:

- Suspected Slipped Capital Femoral Epiphysis (SCFE) with indeterminate or negative frog leg lateral and AP X-rays of the hips with any ONE of the following <sup>(47)</sup>: <sup>(51,52)</sup>
  - Drehmann sign (The hip remains externally rotated when flexed to 90 degrees and there is pain or inability to internally rotate the hip)
  - Limited internal rotation of the hip
- Suspected Chronic Recurrent Multifocal Osteomyelitis after completion of initial X-ray imaging and laboratory evaluation (such as CRP, ESR) <sup>(48,49)</sup><sup>(53-54)</sup>
- Acute limp in a child 5 or less years old <sup>(50)</sup><sup>(55)</sup>

### Suspected Malignancy

- Suspected malignancy with prior imaging that is abnormal or indeterminate

### Known Malignancy <sup>(51,52)</sup>

#### Initial Staging

- For initial staging of a primary extremity tumor

#### Restaging

- Monitoring of a primary extremity tumor on treatment
- End of treatment evaluation of a primary extremity tumor
- Prior to surgery of a primary extremity tumor

#### Surveillance

- Follow-up of known primary cancer of extremity
  - Every 3-6 months for 2-3 years, then every 6-12 months until 5 years then annually
- Signs or symptoms or imaging findings suspicious for recurrence
- Suspected metastatic disease with signs/symptoms and after initial imaging with X-ray or ultrasound

## PRE-OPERATIVE OR POSTOPERATIVE ASSESSMENT /PROCEDURAL EVALUATION

When not otherwise specified in the guideline

Preoperative Evaluation:

- Imaging of the area requested to develop Pre-operative evaluation for a planned surgical planery or procedure

Posto-Operative/Procedural Evaluation:

- ~~When imaging, physical examination, or laboratory findings indicate joint infection, delayed or non-healing or other surgical/procedural complications. Trendelenburg sign <sup>(53)</sup> (49) (contralateral pelvic drop during a single-leg stance) or other indication of muscle or nerve damage after recent hip surgery~~
- ~~Known or sSuspected surgical/procedural complication (such as infection, delayed union, non union) based on prior imaging, physical examination, and/or laboratory findings~~
- A clinical reason is provided how imaging may change management

NOTE: This section applies only within the first few months following surgery ~~Osteoid Osteoma after and an x-ray is done <sup>(50)</sup>~~

- ~~When imaging, physical or laboratory findings indicate joint infection, delayed or non-healing or other surgical/procedural complications.~~
- ~~Trendelenburg sign (49) or other indication of muscle or nerve damage after recent hip surgery~~

~~Painful flatfoot (pes planus) deformity with suspected tarsal coalition, not responsive to non-active conservative care (such as orthotics, rest etc.) <sup>(54)</sup>~~

~~When MRI cannot be performed~~

~~Extra-articular coalition is suspected (bony bridges around the joints)~~

~~Surgical planning~~

## FURTHER EVALUATION OF INDETERMINATE FINDINGS **ON PRIOR IMAGING**

Unless follow-up is otherwise specified within the guideline:

- For initial evaluation of an inconclusive finding on a prior imaging report that requires further clarification
- One follow-up exam of a prior indeterminate MR/CT finding to ensure no suspicious interval change has occurred. (No further surveillance unless specified as highly suspicious or change was found on last follow-up exam).

## CODING AND STANDARDS

### Coding

### CPT Codes

73700, 73701, 73702, +0722T

### Applicable Lines of Business

<input checked="" type="checkbox"/>	CHIP (Children's Health Insurance Program)
<input checked="" type="checkbox"/>	Commercial
<input checked="" type="checkbox"/>	Exchange/Marketplace
<input checked="" type="checkbox"/>	Medicaid
<input checked="" type="checkbox"/> <input type="checkbox"/>	Medicare Advantage

## BACKGROUND

### Conservative Therapy

Conservative therapy should include a multimodality approach consisting of a combination of active and inactive components. Completion of at least one active modality for 4 weeks in the past 6 months is required:

#### Active Modalities

- Physical therapy
- Physician-supervised **Home Exercise Program (HEP)**~~Home Exercise Program (HEP)~~  
(See Below)
- Chiropractic care

#### Inactive Modalities

- Medications (e.g., NSAIDs, steroids, analgesics)
- Injections
- Medical Devices (e.g., TENS unit, bracing)

### Home Exercise Program (HEP)

The following two elements are required for HEP to meet the criteria for completion of a trial of active conservative therapy (ACT):

- Information is provided on specific exercise prescription/plan **AND**
- Follow-up with patient regarding completion of HEP over at least a 4--week period OR documented inability to complete HEP due to increased pain with inability to physically perform the prescribed exercises.

**NOTE:** Patient inconvenience or noncompliance without explanation does not meet the “inability to complete HEP” criterion ~~Conservative Therapy~~

~~Musculoskeletal should include a multimodality approach consisting of a combination of active and inactive components.~~

~~Inactive components such as rest, ice, heat, modified activities, medical devices, (including crutches, immobilizer, metal braces, orthotics, rigid stabilizer, or splints, etc. and not to include neoprene sleeves), medications, injections (bursal, and/or joint, not including trigger point), and diathermy, can be utilized.~~

~~Active modalities may consist of physical therapy, a physician supervised home exercise program\*\* and/or chiropractic care.~~

- ~~guidelines~~
- ~~member with information provided (after suitable 4-week period due to physical reason- i.e., increased pain, inability to physically perform exercises.~~

## ~~Joint Implants and Hardware~~

~~Dual-energy CT may be useful for metal artifact reduction if available but is also imperfect as the correction is based on a projected approximation of x-ray absorption, and it does not correct for scatter.<sup>(52)</sup> Dual-energy CT can be used to characterize crystal deposition disease, such as gout versus CPPD (calcium pyrophosphate deposition).<sup>(43)</sup>~~

## ~~CT and Osteolysis~~

~~Computed tomography scans show both the extent and the location of lytic lesions, they are useful to guide treatment decisions, as well as to assist in planning for surgical intervention when needed, in patients with suspected osteolysis after Total Hip Arthroplasty (THA).~~

## ~~Contraindication and Preferred Studies~~

- Contraindications and reasons why a CT/CTA cannot be performed may include: impaired renal function, significant allergy to IV contrast, pregnancy (depending on trimester)
- Contraindications and reasons why an MRI/MRA cannot be performed may include: impaired renal function, claustrophobia, non-MRI compatible devices (such as non-compatible defibrillator or pacemaker), metallic fragments in a high-risk location, patient exceeds weight limit/dimensions of MRI machine

## **SUMMARY OF EVIDENCE**

### **EULAR recommendations for the use of imaging of the joints in the clinical management of rheumatoid arthritis** <sup>(35)</sup>

**Study Design:** This study involved a systematic review and consensus process by an expert group of rheumatologists, radiologists, methodologists, and experienced rheumatology practitioners from 13 countries. They generated 13 key questions on the role of imaging in rheumatoid arthritis (RA) and systematically searched research evidence to develop 10 recommendations

**Target Population:** Adults ( $\geq 18$  years of age) with a clinical diagnosis of RA

#### **Key Factors:**

- Imaging modalities included conventional radiography, ultrasound, MRI, CT, dual-emission x-ray absorptiometry, digital x-ray radiogrammetry, scintigraphy, and positron emission tomography.
- The study identified 6888 references, from which 199 studies were included in the systematic review.
- Recommendations covered the role of imaging in diagnosing RA, detecting inflammation and damage, predicting outcome and response to treatment, monitoring disease activity, progression, and remission.

### **ACR Appropriateness Criteria Stress (Fatigue-Insufficiency) Fracture Including Sacrum Excluding Other Vertebrae: 2024 Update** <sup>(21)</sup>

**Study Design:** This study is an update of the American College of Radiology Appropriateness Criteria for stress fractures, including both fatigue and insufficiency types. It involved a systematic analysis of the medical literature from peer-reviewed journals and expert panel reviews

**Target Population:** Patients with suspected stress fractures, including athletes, older patients, and patients with predisposing conditions

#### **Key Factors:**

- Radiography is the imaging modality of choice for baseline diagnosis.
- MRI is preferred for diagnosing radiographically occult stress fractures.
- Nuclear medicine scintigraphy and CT may also be useful diagnostic tools.
- The study emphasizes the importance of prompt therapeutic measures to prevent progression to complete fractures.

### **Treatment of Acute Achilles Tendon Rupture** <sup>(7)</sup>

**Study Design:** This review article provides a comprehensive review of the literature on acute rupture of the Achilles tendon and discusses appropriate treatment options

**Target Population:** Patients with acute Achilles tendon rupture, including athletes and elderly individuals

**Key Factors:**

- The Achilles tendon is the strongest and largest tendon in the body but is also the most commonly ruptured.
- The study discusses the controversy surrounding the optimal treatment of acute Achilles tendon rupture, comparing conservative management with operative treatment.
- Recent studies have demonstrated favorable outcomes of conservative treatment using accelerated functional rehabilitation.
- The article emphasizes the importance of early rehabilitation for both conservative and operative treatments

## **ANALYSIS OF EVIDENCE**

**Shared Findings** (7,21,35):

- All three studies highlight the importance of imaging in diagnosing and managing musculoskeletal conditions. Colebatch et al 2013 and Morrison et al 2024 emphasize the role of imaging in diagnosing RA and stress fractures, respectively, while Park et al 2020 discusses the use of imaging in diagnosing Achilles tendon ruptures.
- Early intervention and rehabilitation are crucial for improving patient outcomes. Colebatch et al 2013 and Park et al 2020 both stress the importance of early rehabilitation in managing RA and Achilles tendon ruptures.

**Conclusion** (7,21,35)

In summary, while all three studies emphasize the importance of imaging and early intervention, they differ in their focus on specific conditions and treatment options. Colebatch et al 2013 provides recommendations for imaging in RA, Morrison et al 2024 updates criteria for diagnosing stress fractures, and Park et al 2020 reviews treatment options for Achilles tendon ruptures

## **POLICY HISTORY**

Date	Summary
June 2025	<ul style="list-style-type: none"> <li>● <u>GThis guideline number changed from replaces Evolent Clinical Guideline 057-2 to 2032for Lower Extremity CT</u></li> <li>● <u>Guideline name changed from Lower Extremity CT to Lower Extremity Computed Tomography (CT)</u> <ul style="list-style-type: none"> <li>○ <u>Added a subtitle: Ankle, Foot, Hip, Knee, Leg, Lower Extremity</u></li> </ul> </li> </ul>

Date	Summary
	<ul style="list-style-type: none"> <li>● <u>Added in general information statement regarding guideline criteria development by reputable sources, standard of care, and best practices</u></li> <li>● <u>Tables of orthopedic signs added</u></li> <li>● <u>Metastatic disease and Lisfranc injury indications added</u></li> <li>● <u>Metallosis, Inflammatory arthritis, pediatric, and flatfoot indications clarified and updated</u></li> <li>● <u>Updated Malignancy section</u></li> <li>● <u>Standardized pre/post-operative language</u></li> <li>● <u>Adjusted applicable lines of business – Medicare Advantage checked</u></li> <li>● <u>Background edited</u></li> <li>● <u>Added a Summary of Evidence and Analysis of Evidence</u></li> <li>● <u>References updated and expanded</u></li> </ul>
June 2024	<ul style="list-style-type: none"> <li>● Contraindications and preferred studies section added to the background</li> <li>● Removed CT scanogram for leg length</li> <li>● Updated references and background</li> </ul>
May 2023	<ul style="list-style-type: none"> <li>● <del>Updated orthopedic signs</del></li> <li>● <del>Added:</del></li> <li>● <del>When contraindicated to MRI where appropriate</del></li> <li>● <del>Metallosis</del></li> <li>● <del>Evaluation of indeterminate findings on imaging reports</del></li> <li>● <del>Non-diagnostic imaging</del></li> <li>● <del>CPT code for leg length</del></li> <li>● <del>Statement regarding clinical indications not addressed in the guideline</del></li> <li>● <del>Clarified hip versus pelvis imaging</del></li> <li>● <del>Updated DECT</del></li> <li>● <del>Modified:</del></li> <li>● <del>References</del></li> </ul>

Date	Summary
	<ul style="list-style-type: none"> <li>● <del>Background section</del></li> <li>● <del>Cancer of the extremity section</del></li> </ul>

## LEGAL AND COMPLIANCE

### Guideline Approval

#### Committee

Reviewed / Approved by Evolent Specialty Services Clinical Guideline Review Committee

#### Disclaimer

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## REFERENCES

1. Katz JN, Brophy RH, Chaisson CE, et al. Surgery versus Physical Therapy for a Meniscal Tear and Osteoarthritis. *New England Journal of Medicine*. 2013;368(18):1675-1684. doi:10.1056/NEJMoa1301408
2. Tafur M, Bencardino JT, Roberts CC, et al. ACR Appropriateness Criteria® Chronic Foot Pain. *Journal of the American College of Radiology*. 2020;17(11):S391-S402. doi:10.1016/j.jacr.2020.09.015
3. Beynon A, Le May S, Theroux J. Reliability and validity of physical examination tests for the assessment of ankle instability. *Chiropr Man Therap*. 2022;30(1):58. doi:10.1186/s12998-022-00470-0
4. Netterström-Wedin F, Matthews M, Bleakley C. Diagnostic Accuracy of Clinical Tests Assessing Ligamentous Injury of the Talocrural and Subtalar Joints: A Systematic Review With Meta-Analysis. *Sports Health*. 2022;14(3):336-347. doi:10.1177/19417381211029953
5. Chang EY, Tadros AS, Amini B, et al. ACR Appropriateness Criteria® Chronic Ankle Pain. *Journal of the American College of Radiology*. 2018;15(5):S26-S38. doi:10.1016/j.jacr.2018.03.016
6. Smith SE, Chang EY, Ha AS, et al. ACR Appropriateness Criteria® Acute Trauma to the Ankle. *Journal of the American College of Radiology*. 2020;17(11):S355-S366. doi:10.1016/j.jacr.2020.09.014
7. Park SH, Lee HS, Young KW, Seo SG. Treatment of Acute Achilles Tendon Rupture. *Clin Orthop Surg*. 2020;12(1):1. doi:10.4055/cios.2020.12.1.1
8. Fox MG, Chang EY, Amini B, et al. ACR Appropriateness Criteria® Chronic Knee Pain. *Journal of the American College of Radiology*. 2018;15(11):S302-S312. doi:10.1016/j.jacr.2018.09.016
9. Taljanovic MS, Chang EY, Ha AS, et al. ACR Appropriateness Criteria® Acute Trauma to the Knee. *Journal of the American College of Radiology*. 2020;17(5):S12-S25. doi:10.1016/j.jacr.2020.01.041
10. Chien A, Weaver JS, Kinne E, Omar I. Magnetic resonance imaging of the knee. *Pol J Radiol*. 2020;85:509-531. doi:10.5114/pjr.2020.99415
11. Kulwin RL, Schmidt GJ, Snyder DA, Klitzman RG. Clinical Examination in the Diagnosis of Anterior Cruciate Ligament Injury: A Blinded, Cross-sectional Evaluation. *JAAOS: Global Research and Reviews*. 2023;7(2). doi:10.5435/JAAOSGlobal-D-22-00123
12. Smoak JB, Matthews JR, Vinod A V., Kluczynski MA, Bisson LJ. An Up-to-Date Review of the Meniscus Literature: A Systematic Summary of Systematic Reviews and Meta-analyses. *Orthop J Sports Med*. 2020;8(9):2325967120950306. doi:10.1177/2325967120950306
13. Li X, Hou Q, Zhan X, Chang L, Ma X, Yuan H. The accuracy of MRI in diagnosing and classifying acute traumatic multiple ligament knee injuries. *BMC Musculoskelet Disord*. 2022;23(1):43. doi:10.1186/s12891-021-04976-1

14. Hussin P, Mawardi M, Nizlan NM. The “Chalky Culprit” of acute locked knee. *G Chir.* 2014;35(9-10):239-240. <http://www.ncbi.nlm.nih.gov/pubmed/25419591>
15. Vetrano M. I.S.Mu.L.T. first-time patellar dislocation guidelines. *Muscle, Ligaments and Tendons Journal.* 2017;7(1):1. doi:10.11138/mltj/2017.7.1.001
16. Jawetz ST, Fox MG, Blankenbaker DG, et al. ACR Appropriateness Criteria® Chronic Hip Pain: 2022 Update. *Journal of the American College of Radiology.* 2023;20(5):S33-S48. doi:10.1016/j.jacr.2023.02.019
17. Griffin DR, Dickenson EJ, O'Donnell J, et al. The Warwick Agreement on femoroacetabular impingement syndrome (FAI syndrome): an international consensus statement. *Br J Sports Med.* 2016;50(19):1169-1176. doi:10.1136/bjsports-2016-096743
18. Fortier LM, Popovsky D, Durci MM, Norwood H, Sherman WF, Kaye AD. An Updated Review of Femoroacetabular Impingement Syndrome. *Orthop Rev (Pavia).* 2022;14(3):37513. doi:10.52965/001c.37513
19. Brinkman JC, Reeson E, Chhabra A. Acute Patellar Tendon Ruptures: An Update on Management. *JAAOS: Global Research and Reviews.* 2024;8(4). doi:10.5435/JAAOSGlobal-D-24-00060
20. Ross AB, Lee KS, Chang EY, et al. ACR Appropriateness Criteria® Acute Hip Pain-Suspected Fracture. *Journal of the American College of Radiology.* 2019;16(5):S18-S25. doi:10.1016/j.jacr.2019.02.028
21. Morrison WB, Deely D, Fox MG, et al. ACR Appropriateness Criteria® Stress (Fatigue-Insufficiency) Fracture Including Sacrum Excluding Other Vertebrae: 2024 Update. *Journal of the American College of Radiology.* 2024;21(11):S490-S503. doi:10.1016/j.jacr.2024.08.019
22. Grewal US, Onubogu K, Southgate C, Dhinsa BS. Lisfranc injury: A review and simplified treatment algorithm. *The Foot.* 2020;45:101719. doi:10.1016/j.foot.2020.101719
23. Thomas JD, Kehoe JL. Bone Nonunion. *StatPearls.* Published online March 6, 2023. <https://www.ncbi.nlm.nih.gov/books/NBK554385/>
24. Konarski W, Poboży T, Konarska K, Derczyński M, Kotela I. Understanding Osteochondritis Dissecans: A Narrative Review of the Disease Commonly Affecting Children and Adolescents. *Children.* 2024;11(4). doi:10.3390/children11040498
25. Ong N, Zailan I, Tandon A. Imaging update in arthroplasty. *J Clin Orthop Trauma.* 2021;23:101649. doi:10.1016/j.jcot.2021.101649
26. Weissman BN, Palestro CJ, Fox MG, et al. ACR Appropriateness Criteria® Imaging After Total Hip Arthroplasty. *Journal of the American College of Radiology.* 2023;20(11):S413-S432. doi:10.1016/j.jacr.2023.08.015
27. Lee A, Paiement GD, Penenberg BL, Rajaei SS. Metallosis in Total Hip Arthroplasty. *JBJS Rev.* 2023;11(10). doi:10.2106/JBJS.RVW.23.00105
28. Hart AJ, Sabah SA, Bandi AS, et al. Sensitivity and specificity of blood cobalt and chromium metal ions for predicting failure of metal-on-metal hip replacement. *The Journal of Bone and Joint Surgery-British Volume.* 2011;93-B(10):1308-1313. doi:10.1302/0301-620X.93B10.26249

29. Obara P, McCool J, Kalva SP, et al. ACR Appropriateness Criteria® Clinically Suspected Vascular Malformation of the Extremities. *Journal of the American College of Radiology*. 2019;16(11):S340-S347. doi:10.1016/j.jacr.2019.05.013
30. Ha AS, Chang EY, Bartolotta RJ, et al. ACR Appropriateness Criteria® Osteonecrosis: 2022 Update. *Journal of the American College of Radiology*. 2022;19(11):S409-S416. doi:10.1016/j.jacr.2022.09.009
31. Habusta SF, Mabrouk A, Tuck JA. Synovial Chondromatosis. *StatPearls*. Published online April 22, 2023. <https://www.ncbi.nlm.nih.gov/books/NBK470463/>
32. Pierce JL, Perry MT, Wessell DE, et al. ACR Appropriateness Criteria® Suspected Osteomyelitis, Septic Arthritis, or Soft Tissue Infection (Excluding Spine and Diabetic Foot): 2022 Update. *Journal of the American College of Radiology*. 2022;19(11):S473-S487. doi:10.1016/j.jacr.2022.09.013
33. Wu YW, Wang CY, Cheng NC, et al. 2024 TSOC/TSPS Joint Consensus: Strategies for Advanced Vascular Wound Management in Arterial and Venous Diseases. *Acta Cardiol Sin*. 2024;40(1):1-44. doi:10.6515/ACS.202401\_40(1).20231220A
34. Walker EA, Beaman FD, Wessell DE, et al. ACR Appropriateness Criteria® Suspected Osteomyelitis of the Foot in Patients With Diabetes Mellitus. *Journal of the American College of Radiology*. 2019;16(11):S440-S450. doi:10.1016/j.jacr.2019.05.027
35. Colebatch AN, Edwards CJ, Østergaard M, et al. EULAR recommendations for the use of imaging of the joints in the clinical management of rheumatoid arthritis. *Ann Rheum Dis*. 2013;72(6):804-814. doi:10.1136/annrheumdis-2012-203158
36. Subhas N, Wu F, Fox MG, et al. ACR Appropriateness Criteria® Chronic Extremity Joint Pain-Suspected Inflammatory Arthritis, Crystalline Arthritis, or Erosive Osteoarthritis: 2022 Update. *Journal of the American College of Radiology*. 2023;20(5):S20-S32. doi:10.1016/j.jacr.2023.02.020
37. Malartre S, Bachasson D, Mercy G, et al. MRI and muscle imaging for idiopathic inflammatory myopathies. *Brain Pathology*. 2021;31(3):e12954. doi:10.1111/bpa.12954
38. Nagy H, Veerapaneni KD. Myopathy. *StatPearls*. Published online August 14, 2023. <https://www.ncbi.nlm.nih.gov/books/NBK562290/>
39. Carotti M, Salaffi F, Filippucci E, et al. Clinical utility of Dual Energy Computed Tomography in gout: current concepts and applications. *Acta Biomedica*. 2020;91(8-S):116-124. doi:10.23750/abm.v91i8-S.9942
40. Shang J, Zhou LP, Wang H, Liu B. Diagnostic Performance of Dual-energy CT Versus Ultrasonography in Gout: A Meta-analysis. *Acad Radiol*. 2022;29(1):56-68. doi:10.1016/j.acra.2020.08.030
41. Fortier LM, Markel M, Thomas BG, Sherman WF, Thomas BH, Kaye AD. An Update on Peroneal Nerve Entrapment and Neuropathy. *Orthop Rev (Pavia)*. 2021;13(2):24937. doi:10.52965/001c.24937
42. Griffith JF, Guggenberger R. Peripheral Nerve Imaging. In: *Musculoskeletal Diseases 2021-2024: Diagnostic Imaging [Internet]*. Springer; 2021:259-268. doi:10.1007/978-3-030-71281-5\_18

43. Campbell EA, Wilbert CD. Foreign Body Imaging. *StatPearls*. Published online July 30, 2023. <https://pubmed.ncbi.nlm.nih.gov/29262105/>
44. Polichetti C, Borruto MI, Lauriero F, et al. Adult Acquired Flatfoot Deformity: A Narrative Review about Imaging Findings. *Diagnostics*. 2023;13(2):225. doi:10.3390/diagnostics13020225
45. Docquier PL, Maldaque P, Bouchard M. Tarsal coalition in paediatric patients. *Orthopaedics & Traumatology: Surgery & Research*. 2019;105(1):S123-S131. doi:10.1016/j.otsr.2018.01.019
46. TEPELENIS K, SKANDALAKIS GP, PAPATHANAKOS G, et al. Osteoid Osteoma: An Updated Review of Epidemiology, Pathogenesis, Clinical Presentation, Radiological Features, and Treatment Option. *In Vivo (Brooklyn)*. 2021;35(4):1929-1938. doi:10.21873/invivo.12459
47. Aprato A, Conti A, Bertolo F, Massè A. Slipped capital femoral epiphysis: current management strategies. *Orthop Res Rev*. 2019;11:47-54. doi:10.2147/ORR.S166735
48. Roderick MR, Shah R, Rogers V, Finn A, Ramanan A V. Chronic recurrent multifocal osteomyelitis (CRMO) – advancing the diagnosis. *Pediatric Rheumatology*. 2016;14(1):47. doi:10.1186/s12969-016-0109-1
49. Zhao DY, McCann L, Hahn G, Hedrich CM. Chronic nonbacterial osteomyelitis (CNO) and chronic recurrent multifocal osteomyelitis (CRMO). *J Transl Autoimmun*. 2021;4:100095. doi:10.1016/j.jtauto.2021.100095
50. Safdar NM, Rigsby CK, Iyer RS, et al. ACR Appropriateness Criteria® Acutely Limping Child Up To Age 5. *Journal of the American College of Radiology*. 2018;15(11):S252-S262. doi:10.1016/j.jacr.2018.09.030
51. Referenced with permission from the National Comprehensive Cancer Network Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Bone Cancer Version 1.2025. © National Comprehensive Cancer Network, Inc. 2025. All rights reserved. To view the most recent and complete version of the guideline, go online to NCCN.org.
52. Referenced with permission from the National Comprehensive Cancer Network Clinical Practice Guidelines in Oncology (NCCN Guidelines®) for Soft Tissue Sarcoma Version 4.2024. © National Comprehensive Cancer Network, Inc. 2025. All rights reserved. To view the most recent and complete version of the guideline, go online to NCCN.org.
53. Gogu S, Gandbhir VN. Trendelenburg Sign. *StatPearls*. Published online November 14, 2022. <https://www.ncbi.nlm.nih.gov/books/NBK555987/>