

AmeriHealth Caritas Louisiana

National Imaging Associates, Inc.*	
Clinical guidelines LOWER EXTREMITY CT (Foot, Ankle, Knee, Leg or Hip CT)	Original Date: September 1997
CPT Codes: 73700, 73701, 73702	Last Revised Date: March 20221
Guideline Number: NIA_CG_057-2	Implementation Date: January 20232

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

(Plain radiographs must precede CT evaluation)

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.

Joint-specific provocative orthopedic examination when MRI is contraindicated or cannot be performed ([see Table 1](#))

Note: With a positive orthopedic sign, an initial x-ray is always preferred. However, it is not required to approve advanced imaging.

- Ankle
 - Unstable syndesmotom injury (high ankle injury)
 - With inconclusive stress x-rays (a standing CT is preferred)
 - Can have positive fibular translation, squeeze or cotton test, but imaging may be needed to confirm diagnosis
- Knee¹⁻⁷ (~~Doral, 2018; Fox, 2018; Katz, 2013; Mohankumar, 2014; Slaughter, 2014; Smith, 2015; Taljanovic, 2019~~)
 - Any positive test listed
 - McMurray's
 - ~~Thessaly~~
 - Apley's
 - Lachman's
 - Anterior or Posterior Drawer sign
 - Varus or valgus stress
 - ~~Acute mechanical locking of the knee not due to guarding~~⁸ (~~Hussin, 2014~~)
 - ~~_____~~

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1— Lower Extremity CT

- Hip
 - Anterior Impingement sign (labral tear)⁹⁻¹¹ (~~Hananouchi, 2012; Naraghi, 2015; Ross, 2018~~)
- Posterior Impingement sign (labral tear)¹² (~~Groh, 2009~~)

Joint or muscle pain without positive findings on an orthopedic exam as listed above, after x-ray completed and an MRI is contraindicated or cannot be performed - (does not apply to young children)^{3, 13} (~~Katz, 2013; Mordecai, 2014~~)

- Persistent joint or musculotendinous pain unresponsive to conservative treatment*, within the last 6 months which includes active medical therapy (physical therapy, chiropractic treatments, and/or physician-supervised exercise**) of at least four (4) weeks, **OR**
- With progression or worsening of symptoms during the course of conservative treatment
- Persistent hip mechanical symptoms including clicking, locking, catching, giving way or hip instability with a clinical suspicion of labral tear, with or without clinical findings suggestive of impingement^{12, 14} (~~Groh, 2009; Mintz, 2017~~)

Ankle instability and suspected anterior talofibular ligament rupture (anterior and posterior drawer tests) as a result of a sprain requires initial active conservative therapy (above) and x-ray

Painful acquired or congenital flatfoot deformity in an adult, after x-ray completed and MRI is contraindicated

- After failure of active conservative therapy listed above^{15, 16} (~~Abousayed, 2017; Thorpe, 2012~~)

Extremity Mass

- Mass or lesion after non-diagnostic x-ray or ultrasound¹⁷ (~~Murphey, 2018~~) and MRI cannot be performed. CT is better than MRI to evaluate mass calcification or bone involvement and may complement or replace MRI¹⁸ (~~Subhawong, 2010~~)
 - Baker's cyst should be initially evaluated with ultrasound
 - If superficial, then ultrasound is the initial study
 - If deep, then x-ray is the initial study

Known Cancer of the Extremity¹⁹⁻²³

(~~Bestic, 2019; Fitzgerald, 2015; Holzapfel, 2015; Kircher, 2012; NCCN, 2019~~)

- Cancer staging
- Cancer Restaging
- Signs or symptoms of recurrence

Infection of Bone or Joint^{24, 25}

(~~Dodwell, 2013; Glaudemans, 2019~~)

Note: MRI and nuclear medicine studies are recommended for acute infection as they are more sensitive in detecting early changes of osteomyelitis ~~(Mandell, 2017)~~.^{26, 27} CT is better at demonstrating findings of chronic osteomyelitis (sequestra, involucrum, cloaca, sinus tracts) as well as detecting soft tissue gas and foreign bodies ~~(Fayad, 2007)~~.²⁸

- Abnormal x-ray or ultrasound
- Negative x-ray but with a clinical suspicion of infection
 - Signs and symptoms of joint or bone infection include:
 - Pain and swelling
 - Decrease range of motion
 - Fevers
 - Laboratory findings of infection include:
 - Elevated ESR or CRP
 - Elevated white blood cell count
 - Positive joint aspiration
- Ulcer (diabetic, pressure, ischemic, traumatic) with signs of infection (redness, warm, swelling, pain, discharge which may range from white to serosanguineous) that is not improving despite treatment and bone or deep infection is suspected²⁹
 - Increased suspicion if size or temperature increases, bone is exposed/positive probe-to-bone test, new areas of breakdown, new smell³⁰ ~~(Bowers, 2020)~~
- Neuropathic foot with friable or discolored granulation tissue, foul odor, non-purulent discharge, and delayed wound healing³¹ ~~(Pitocco, 2019)~~

Osteonecrosis (Avascular necrosis (AVN), Legg-Calve-Perthes Disease) when MRI is contraindicated or cannot be performed³²⁻³⁴ ~~(Felten, 2019; Murphey, 2014; 2016)~~

- Abnormal x-ray
- Normal or indeterminate x-rays but symptomatic and high risk (e.g., glucocorticosteroid use, renal transplant recipient, glycogen storage disease, alcohol abuse ~~(Fukushima, 2010)~~,³⁵ sickle cell anemia³⁶ ~~(Wali, 2011)~~)

For evaluation of known or suspected autoimmune disease (e.g., rheumatoid arthritis) and MRI is contraindicated³⁷
~~(Colebatch, 2013)~~

- 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 early rheumatoid arthritis
- Follow-up to determine treatment efficacy of advanced rheumatoid arthritis if x-ray and ultrasound are equivocal or noncontributory

Crystalline Arthropathy

- Dual-energy CT can be used to characterize crystal deposition disease, such as gout versus CPPD³⁸ ~~(Chou, 2017)~~

Trauma

Bone Fracture

- Suspected stress or insufficiency fracture with a negative initial x-ray³⁹⁻⁴¹ ~~(Berncardino, 2017; Patel, 2011; Sadineni, 2015)~~:
 - If hips and MRI cannot be done
 - ~~if Non-hip extremities: if x-rays, taken 10-14 days after the injury or clinical assessment, are other parts of the extremities and repeat x rays in 10-14 days are~~ negative or nondiagnostic⁴²
 - If at high risk for a complete fracture with conservative therapy (e.g., navicular bone) and MRI cannot be performed⁴³ ~~(Kellar, 2020)~~
- Suspected acute hip fracture with initial x-rays negative or non-diagnostic^{11, 44} ~~(Gill, 2013; Ross, 2019)~~
- Intra articular fractures that may require surgery (i.e., depressed tibial plateau fracture)⁴⁵ ~~(Prat-Fabregat, 2017)~~
- Nonunion or delayed union as demonstrated by no healing between two sets of x-rays. If a fracture has not healed by 4-6 months, there is delayed union. Incomplete healing by 6-8 months is nonunion^{46, 47} ~~(Morshed, 2014; Salih, 2015)~~

Tendon or Muscle Rupture after X-Ray and MRI is contraindicated or cannot be performed⁴⁸⁻⁵⁰ ~~(Garras, 2012; Peck J, 2017; Wilkins, 2012)~~

- Clinical suspicion based on mechanism of injury and physical findings

Suspected ACL Rupture - Acute knee injury with physical exam limited by pain and swelling with x-ray completed (Wheless, 2018) if MRI is contraindicated⁶ ~~(Taljanovic, 2019)~~

- Inability to perform because of pain and swelling should be considered a red flag
- Suspicion should be based on mechanism of injury, i.e., twisting, blunt force
- Normal x-ray:
 - Extreme pain, inability to stand, audible pop at time of injury, very swollen joint, leg numbness
- Abnormal x-ray:
 - Large joint effusion on x-ray knee effusion⁵¹ ~~(Cecava, 2018)~~

Osteochondral Lesions (defects, fractures, osteochondritis dissecans) and x-ray done (if MRI contraindicated or cannot be done)^{6, 14, 52-54} ~~(Mintz 2017; Smith, 2012; Taljanovic, 2019; Van Bergen, 2016; Van Dijk, 2010)~~

- Clinical suspicion based on mechanism of injury and physical findings

Foreign Body⁵⁵
~~(Laya, 2017)~~

- Indeterminate x-ray and ultrasound

Loose bodies or synovial chondromatosis seen on x-ray or ultrasound

- In the setting of joint pain⁵⁶ ~~(Rajani, 2016)~~

Peripheral Nerve Entrapment (e.g., tarsal tunnel, Morton's neuroma) and MRI is contraindicated, including any of the following⁵⁷⁻⁶⁰

~~(Domkundwar, 2017; Dong 2012; Donovan, 2010; Tes, 2015)~~

- Abnormal Electromyogram or Nerve conduction study
- Abnormal x-ray or ultrasound
- Clinical suspicion and failed 4 weeks conservative treatment including at least 2 of the following (active treatment with physical therapy is not required):
 - Activity modification
 - Rest, ice, or heat
 - Splinting or orthotics
 - Medication

Pediatrics

Note: Leg length discrepancy – the literature indicates that standing plain film x-rays are preferred, but there are some advantages to using a CT scanogram instead and may be preferred^{61, 62}

~~(Guggenberger, 2014; Sabharwal, 2008)~~

- Osteoid Osteoma after an x-ray is done⁶³ ~~(Iyer, 2012)~~
- Painful flatfoot (Pes planus) deformity with suspected tarsal coalition, not responsive to active conservative care⁶⁴ ~~(Bouchard, 2014)~~
 - When MRI cannot be performed; **OR**
 - Extra-articular coalition is suspected (bony bridges around the joints); **OR**
 - When needed for surgical planning⁶⁵ ~~(Glaser, 2016)~~
- Slipped Capital Femoral Epiphysis and Chronic Recurrent Multifocal Osteomyelitis – MRI is the appropriate modality, rather than CT

Pre-operative/procedural evaluation

- Pre-operative evaluation for a planned surgery or procedure

Post-operative/procedural evaluation

- When imaging, physical, or laboratory findings indicate joint infection, delayed or non-healing, or other surgical/procedural complications
- Joint prosthesis loosening or dysfunction, x-rays non-diagnostic^{66, 67} ~~(Fritz, 2014, 2015)~~
- Trendelenburg sign or other indication of muscle or nerve damage after recent hip surgery

Table 1: Positive Orthopedic Joint Tests, Lower Extremity

ANKLE

Fibular translation
Squeeze
Cotton
Thompson
Thumb squeeze test
Mulder click

HIP

KNEE

Anterior draw
Pivot Shift Test
Lachman
Posterior tibial Sag
Posterior Draw
McMurray's Test
Valgus stress
Varus stress
Ege

BACKGROUND

Plain radiographs 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.

OVERVIEW

***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 (such as 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.

****Home Exercise Program (HEP)** – the following two elements are required to meet guidelines for completion of conservative therapy:

- Information provided on exercise prescription/plan AND
- Follow up with member with information provided regarding completion of HEP (after suitable 4-week period), or inability to complete HEP due to physical reason- i.e., increased pain, inability to physically perform exercises. (Patient inconvenience or noncompliance without explanation does not constitute “inability to complete” HEP).

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 ~~(Boas, 2012)~~.⁶⁸ Dual-energy CT can be used to characterize crystal deposition disease, such as gout versus CPPD (calcium pyrophosphate deposition) ~~(Chou, 2017)~~.³⁸

CT and Ankle Fractures — One of the most frequently injured areas of the skeleton is the ankle. These injuries may include ligament sprains, as well as fractures. A suspected fracture is first imaged with conventional radiographs in anteroposterior, internal oblique and lateral projections. CT is used in patients with complex ankle and foot fractures after radiography.

CT and Hip Trauma — Computed tomography is primarily used to evaluate acute trauma, e.g., acetabular fracture or hip dislocation. It can detect intraarticular fragments and associated articular surface fractures, and it is useful in surgical planning.

CT and Knee Fractures — CT is used after plain films to evaluate fractures to the tibial plateau. These fractures occur just below the knee joint, involving the cartilage surface of the knee. Soft tissue injuries are usually associated with the fractures. The meniscus is a stabilizer of the knee, and it is very important to detect meniscal injury in patients with tibial plateau fractures. CT of the knee with two-dimensional reconstruction in the sagittal and coronal planes may be performed for evaluation of injuries with multiple fragments and comminuted fractures. Spiral CT has an advantage of rapid acquisition and reconstruction times and may improve the quality of images of bone. Soft tissue injuries are better demonstrated with MRI.

CT and Knee Infections — CT is used to depict early infection which may be evidenced by increased intraosseous density or the appearance of fragments of necrotic bone separated from living bone by soft tissue or fluid density. Contrast-enhanced CT may help in the visualization of abscesses and necrotic tissue.

CT and Knee Tumors — CT complements arthrography in diagnosing necrotic malignant soft-tissue tumors and other cysts and masses in the knee. Meniscal and ganglion cysts are palpable masses around the knee. CT is useful in evaluations of the vascular nature of lesions.

CT and Legg-Calve-Perthes Disease (LPD) — This childhood condition is associated with an insufficient blood supply to the femoral head which is then at risk for osteonecrosis. Clinical signs of LPD include a limp with groin, thigh, or knee pain. Flexion and adduction contractures may develop as the disease progresses and eventually movement may only occur in the flexion-extension plane. This condition is staged based on plain radiographic findings. CT scans are used

in the evaluation of LPD and can demonstrate changes in the bone trabecular pattern. They also allow diagnosis of bone collapse and sclerosis early in the disease where plain radiography is not as sensitive.

CT and Osteolysis – Since 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).

CT and Tarsal Coalition – This is a congenital condition in which two or more bones in the mid-foot or hind-foot are joined. It usually presents during late childhood or late adolescence and is associated with repetitive ankle sprains. Mild pain, deep in the subtalar joint and limited range of motion are clinical symptoms. Tarsal coalition is detectable on oblique radiographs, but these are not routinely obtained at many institutions. Clinical diagnosis is not simple; it requires the expertise of skilled examiners. CT is valuable in diagnosing tarsal coalition because it allows differentiation of osseous from non-osseous coalitions and depicts the extent of joint involvement as well as degenerative changes. It may also detect the overgrowth of the medial aspect of the talus that may be associated with talocalcaneal coalitions.

American Academy of Pediatrics “Choosing Wisely” Guidelines advise against ordering advanced imaging studies (MRI or CT) for most musculoskeletal conditions in a child until all appropriate clinical, laboratory and plain radiographic examinations have been completed. “History, physical examination, and appropriate radiographs remain the primary diagnostic modalities in pediatric orthopedics, as they are both diagnostic and prognostic for the great majority of pediatric musculoskeletal conditions. Examples of such conditions would include, but not be limited to, the work up of injury or pain (spine, knees and ankles), possible infection, and deformity. MRI examinations and other advanced imaging studies frequently require sedation in the young child (5 years old or less) and may not result in appropriate interpretation if clinical correlations cannot be made. Many conditions require specific MRI sequences or protocols best ordered by the specialist who will be treating the patient...if you believe findings warrant additional advanced imaging, discuss with the consulting orthopedic surgeon to make sure the optimal studies are ordered ~~(AAP, 2018)~~.”⁶⁹

POLICY HISTORY

Date	Summary
<u>March 2022</u>	<ul style="list-style-type: none"> Clarification of language for non-hip stress fractures- Deleted Thesaly<u>Thessaly</u> sign based on updated literature- <u>Checked sources-</u>
May 2021	<ul style="list-style-type: none"> Added unstable syndesmotic injury Removed ankle instability Added the following: navicular bone to high risk stress fracture, information about suspected bone infection in the setting of ulcers and neuropathy and following treatment for rheumatoid arthritis

	<ul style="list-style-type: none"> • Clarified that pre-operative imaging is for <i>a planned surgery or procedure</i> • Removed *CT or MRI requests are <i>not</i> approvable for the following total knee arthroplasty (TKA) procedures: <ul style="list-style-type: none"> ○ Procedures utilizing computer-navigated or patient-specific or gender-specific instrumentation (Johnson, 2011) ○ Bicompartamental arthroplasty (investigational at this time) (Dudhniwala, 2016) ○ Note: Robot-assisted TKA (Makoplasty) (Banerjee, 2015; Nair, 2014) <p>These surgical procedures are not considered a covered service and are not reimbursable based on lack of current scientific evidence for clinically important improvement, safety or efficacy; or based on scientific evidence of increased risk of serious complications.</p> <ul style="list-style-type: none"> • Included early complications of hip surgery to the post operative evaluation list
May 2020	<ul style="list-style-type: none"> • Expanded orthopedic signs listing and moved to the top • Added note: With a positive orthopedic sign, an initial x-ray is always preferred. However, it is not required to approve advanced imaging. • Added labral tear/posterior impingement to approvable list • Added flatfoot deformity • Expanded section about initial work-up of a mass • Added the National Comprehensive Care Network as a reference for imaging guidance • Expanded the section on osteomyelitis • Added section on crystalline arthropathy • Revised the section on non or delayed union • Added a section on loose bodies and synovial chondromatosis • Added a pediatric section • Removed Makoplasty from not approvable list • Added a section about joint implants and hardware to the background section • Updated references
May 2019	<ul style="list-style-type: none"> • Reformatting in parallel with the new LE MRI. Updated references • Added indication: peripheral nerve entrapment • Criteria for approval of existing indications specified within the parameters of the current evidence base

	<ul style="list-style-type: none"> • Added initial statement about approvals: ‘Some indications are for MRI, CT, or MR or CT Arthrogram. More than one should not be approved at the same time’. • Added Extremity mass indications including peripheral lymphadenopathy; and mass with increased risk for malignancy • Modified Known Cancer indication to be more broad – ‘cancer staging, cancer restaging, signs or symptoms of recurrence’ • Expanded section for infection of bone or joint to include list of signs or symptoms and laboratory findings (elevated ESR or CRP, elevated white blood cell count, positive joint aspiration)
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Reviewed / Approved by NIA Clinical Guideline Committee

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.~~

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Reviewed / Approved by NIA Clinical Guideline Committee

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.

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