| National Imaging Associates, Inc.* | |
|---|---|
| **Clinical guidelines**<br>**LOWER EXTREMITY MRI**<br>**(Foot, Ankle, Knee, Leg or Hip MRI)** | **Original Date: September 1997** |
| **CPT Codes: 73718, 73719, 73720, 73721, 73722, 73723, +0698T** | **Last Revised Date: May 20210** |
| **Guideline Number: NIA_CG_057-4** | **Implementation Date: January 20221** |

**INDICATIONS FOR LOWER EXTREMITY MRI (FOOT, ANKLE, KNEE, LEG or HIP)**
**(Plain radiographs must precede MRI evaluation)**

**Some indications are for MRI, CT, or MR or CT Arthrogram. More than one should not be approved at the same time.**

**If an MR Arthrogram fits approvable criteria below, approve as MRI**

**Joint specific provocative orthopedic examination**
(Fox, 2018):
**Note**: With a positive orthopedic sign, an initial x-ray is always preferred. However, it is not required to approve advanced imaging (see Table 1).

- Ankle
  - Unstable syndesmotic injury (high ankle injury)
    - With inconclusive stress xrays and a standing CT cannot be done
    - Can have positive fibular translation, squeeze or cotton test, but imaging may be needed to confirm diagnosis
    - Positive drawer sign ≥ 4 days after injury (Vuurberg, 2018)
- Knee (DBennett, 2012; Doral, 2018; Katz, 2013; Mohankumar, 2014; Slaughter, 2014; Smith, 2015; Taljanovic,uite, 20194)
  - Joint instability or meniscal injury on exam, demonstrated with a positive
    - McMurray's
    - Thessaly
    - Apley's
    - Lachman's
    - Anterior or Posterior Drawer sign

* National Imaging Associates, Inc. (NIA) is a subsidiary of Magellan Healthcare, Inc.

- Varus or valgus stress
- Acute mechanical locking of the knee not due to guarding (Hussin, 2014)

- Hip
  - Anterior Impingement sign (labral tear) (Hananouchi, 2012; Naraghi, 2015; **Ross, 2018**~~Ward, 2013~~)
  - Posterior Impingement sign (labral tear) (Groh, 2009)

**Joint or muscle pain without positive findings on an orthopedic exam as listed above,** after x-ray completed (Katz, 2013; Mordecai, 2014) (does not apply to young children).

- 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 (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

- After failure of active conservative therapy listed above (Abousayed, 2017; Thorpe, 2012)

**Extremity Mass**

- Mass or lesion after non-diagnostic x-ray or ultrasound (Murphey, 2018)
  - Baker's cyst should be initially evaluated with ultrasound
  - If superficial mass, then ultrasound is the initial study.
  - If deep mass, then x-ray is the initial study.

**Known Cancer of the Extremity**

(**Bestic, 2019**; Fitzgerald, 2015; Holzapfel, 2015; Kircher, 2012; ~~Morrison, 2013;~~ NCCN, 2019)

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

**Infection of Bone or Joint**

(Beaman, 2017; Dodwell, 2013, Glaudemans, 2019)

- 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
    - Decreased 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 suspected
            - Increased suspicion if size or temperature increases, bone is exposed/positive probe-to-bone test, new areas of breakdown, new smell (Bowers, 2020)
        - Neuropathic foot with friable or discolored granulation tissue, foul odor, non-purulent discharge, and delayed wound healing (Pitocco, 2019)

- A suspicion of osteomyelitis of the foot in patients with diabetes after initial x-ray (ACR, 2019)

**Osteonecrosis (e.g., Avascular Necrosis (AVN), Legg-Calve-Perthes Disease)**
(Felten, 2019; Murphey, 2014)

- Abnormal x-ray
- Normal or Indeterminate X-rays, but symptomatic and high risk
    - Glucocorticosteroid use
    - Renal Transplant recipient
    - Alcohol abuse (Fukushima, 2010)
    - Sickle Cell Anemia (Wali, 2011)

**For evaluation of known or suspected autoimmune disease (e.g., rheumatoid arthritis)** (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) (Colebatch, 2013).
- To determine change in treatment or when diagnosis is uncertain prior to start of treatment (Colebatch, 2013)
- Follow-up to determine treatment efficacy of the following:
    - Early rheumatoid arthritis
    - Follow-up to determine treatment efficacy of advanced rheumatoid arthritis if arthritis if x-ray and ultrasound are equivocal or noncontributory

**Trauma**

**Bone Fracture**

- Suspected stress or insufficiency fracture with a negative initial x-ray (Bencardino, 2017; Sadineni, 2015):
    - If hips, then approve an immediate MRI
    - Suspicion of a hip fracture in a pregnant patient does not require an initial x-ray
    - If other parts of the extremities and repeat x-rays in 10-14 days are negative or nondiagnostic
    - If at high risk for a complete fracture with conservative therapy **(e.g.,~~:~~ navicular bone)**, then immediate MRI is warranted (Kellar, 2020)
- Suspected acute hip fracture with initial x-rays negative or non-diagnostic (~~Ross, 2019;~~ Gill, 2013**; Ross, 2019**)
- Pathologic fracture on x-ray (Fayad, 2005)
- Intra articular fractures that may require surgery. (e.g., depressed tibial plateau fracture ~~)~~ (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, CT is the preferred study (Morshed, 2014)

**Tendon or Muscle Rupture after X-Ray**
(Garras, 2012; Peck, 2017; Rubin, 2012; 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
(Cecava, 2018; Wheeless, 2018)

- 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:
    - ~~o~~ Large joint effusion on x-ray knee effusion ~~(Cecava, 2018)~~
    - 

**Osteochondral lesions** (defects, fractures, osteochondritis dissecans) and x-ray ~~done~~ **completed**
(Mintz, 2017; Smith, 2012; **Taljanovic**~~uite~~, 2019~~4~~; Van Dijk, 2010)

- Clinical suspicion based on mechanism of injury and physical findings

**Foreign Body**
(Laya, 2017)

- Indeterminate x-ray and ultrasound

**Loose bodies or synovial chondromatosis seen on xray or ultrasound**

- In the setting of joint pain (Rajani, 2016)

**Hip Impingement (Femoroacetabular Impingement)**

- With negative, equivocal, or non diagnostic x-rays (Mintz, 2017) (and imaging would change treatment – active conservative care or surgery are the two mainstays of treatment) (Kekatpure, 2017)
- To determine candidacy for hip preservation surgery (Li, 2016)

**Known or suspected inflammatory myopathies**: (Includes polymyositis, dermatomyositis, immune-mediated necrotizing myopathy, inclusion body myositis)
(Jia, 2017; Joyce, 2012)

- For diagnosis
- For biopsy planning

**Peripheral Nerve Entrapment (e.g., tarsal tunnel, Morton's neuroma ~~etc~~)**
(Domkundwar, 2017; Dong, 2012; Donovan, 2010; Tos, 2015)

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

**Pediatrics~~:~~**

- Painful flatfoot deformity with suspected tarsal coalition, not responsive to active conservative care (Bouchard, 2014).
- Slipped Capital Femoral Epiphysis with negative frog leg and AP x-rays of the hips but clinically suspected) (Hesper, 2017; Kamegaya, 2011; Peck, 2017)
    - Drehman sign
    - Limited internal rotation of the hip
    - Consider imaging the asymptomatic contralateral hip with a normal x-ray to detect early SCFE if prophylactic surgery is planned (Balch Samora, 2018)
- Chronic Recurrent Multifocal Osteomyelitis after initial work-up (labs and x-ray) (Roderick, 2016)
- Acute limp in a child 5 or less years old, concern for infection (initial x-rays not needed) (Safdar, 2018)
- There is no relevant literature regarding the use of MRI pelvis to the feet in the initial evaluation of acute limp with nonlocalized symptoms and no concern for infection.

- Osteoid Osteoma – MRI not usually done because x-ray and CT more accurate for diagnosis (Iyer, 2012)

**Pre-operative/procedural evaluation:**

- Pre-operative evaluation for a planned surgery or procedure ~~if the imaging provides diagnostic information that is not available on prior studies (provider should be referred to the health plan for nondiagnostic surgical planning studies)~~(See exclusions*)
- ~~*CT or MRI requests are **NOT approvable for the following** total knee arthroplasty (TKA) procedures:~~
  - ~~Procedures utilizing computer-navigated or patient-specific or gender-specific instrumentation (Johnson, 2011)~~
  - ~~Bicompartmental arthroplasty (investigational at this time) (Dudhniwala, 2016)~~

  ~~**Note**: 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.~~

**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 (Fritz, 2014, 2015) ~~4, 2015)~~
- **Trendelenburg sign or other indication of muscle or nerve damage after recent hip surgery**

## Table 1: Positive Orthopedic Joint Tests, Lower Extremity

**ANKLE**

- ~~Posterior draw~~
- **Fibular translation**
- **Squeeze**
- **Cotton**
- Thompson
- Thumb squeeze test
- Mulder click

**HIP**

- ~~Trendelenburg~~

**KNEE**

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

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**BACKGROUND~~:~~**

Magnetic resonance imaging shows the soft tissues and bones. With its multiplanar capabilities, high contrast, and high spatial resolution, it is an accurate diagnostic tool for conditions affecting the joint and adjacent structures. MRI ~~has the ability to~~**can** positively influence clinicians' diagnoses and management plans for patients with conditions such as primary bone cancer, fractures, abnormalities in ligaments/tendons/cartilage, septic arthritis, and infection/inflammation.

**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~~**including** crutches, immobilizer, metal braces, orthotics, rigid stabilizer~~,~~ or splints, ~~etc~~**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.~~**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** - The presence of a metallic implant or metallic fixation device does not represent a contraindication to MRI. More recently, the advent of implants made with less ferromagnetic alloys and technical advancements of MR sequences (metal artifact reduction sequences [MARS], slice encoding for metal artifact correction [SEMAC], and multi-acquisition with variable-resonance image combination [MAVRIC]) made MRI fully feasible in patients with joint implants, with artifacts mostly limited to the area of the implant itself (Glaudemans, 2019).

**Stress Fractures-** "Certain stress fractures are considered high risk based on a tendency for nonunion or delayed union. High-risk stress fractures include the anterior tibial diaphysis, lateral femoral neck and femoral head... ~~(~~patella, medial malleolus, navicular, fifth metatarsal base, proximal second metatarsal, tibial hallux sesamoid, and talus. The second-line test to diagnose a stress fracture should be guided by the location of the patient's pain and likelihood of high-risk injury. A follow-up radiographic examination has increased sensitivity compared to initial radiographs but is less sensitive than MRI~~"~~ (**Bencardino**,~~ACR,~~ 201~~7~~6)."

**MRI and Knee Trauma -** MRI is an effective means of evaluating internal derangements of the knee with a very high accuracy for detection of meniscal injury. On MRI of the knee, meniscal injury may appear "free-floating", corresponding to a meniscal avulsion or detachment from the tibial plateau. The floating meniscus seen on MRI is a result of significant trauma. It may also be associated with significant ligamentous injury. The results of the MRI are valuable to the surgeon as ~~he plans~~**they plan** to reattach the meniscus to the tibial plateau.

**MRI and Osteonecrosis** – Osteonecrosis is a complication of knee surgery which may be accompanied by new or persistent pain after meniscal surgery. It can be detected by MRI with subcortical low signal intensity of T1-weighted images with or without central high signal intensity on T2-weighted images. Osteonecrosis can result in collapse of the articular surface.

**MRI 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. MRI is used in

identifying the early stage of LPD when plain films are normal. It is also used in preoperative planning to diagnose “hinge abduction” (lateral side of the femoral head contacts the acetabular margin and femoral head does not slide as it should). However, MRI is not used as a standard diagnostic tool.

**MRI and Septic Arthritis** – Young children and older adults are the most likely to develop septic arthritis in the hip joint. Early symptoms include pain in the hip, groin, or thigh along with a limping gait and fever. It is sometimes hard to differentiate this condition from transient synovitis, a less serious condition with no known long-term sequelae. MRI may help in the differential diagnosis of these two conditions. Coronal T1-weighted MRI, performed immediately after contrast administration, can evaluate blood perfusion at the femoral epiphysis.

**MRI and Slipped Capital Femoral Epiphysis** – This condition, where the femoral head is displaced in relation to the femoral neck, is the most common hip disorder in adolescents, and it is more common in obese children. Its symptoms include a limping gait, groin pain, thigh pain and knee pain. Most cases are ~~stable~~**stable**, and the prognosis is good with early diagnosis and treatment. Unstable slipped capital femoral epiphysis may lead to avascular necrosis. MRI is used for diagnosis of slipped capital femoral epiphysis. Its image can be oriented to a plane orthogonal to the plane of the physis to detect edema in the area of the physis.

**MRI and Tarsal Coalition** – This is a congenital condition in which two or more bones in the midfoot or hindfoot 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. MRI is valuable in diagnosing tarsal coalition because it allows differentiation of osseous from non-osseous coalitions ~~and also~~**and** depicts the extent of joint involvement as well as degenerative changes. It may also detect overgrowth of the medial aspect of the talus that may be associated with talocalcaneal coalitions.

**MRI and Tarsal Tunnel** – Tarsal Tunnel Syndrome is due to compression of the posterior tibial nerve as it passes through the tarsal tunnel into the foot. Compression can cause a sensation of burning or numbness to the bottom of the foot. Common causes include flat foot, over-protonation, and arthritis. Nerve conduction studies can reveal damage to the posterior tibial nerve. MRI may be valuable in demonstrating other structures causing extrinsic compression on the nerve (Glaser, 2016).

**MRI and Chronic Recurrent Multifocal Osteomyelitis** ~~-~~– **This n**~~N~~oninfectious inflammation of the bone in children~~,~~ can have ~~non-~~**non-**elevated inflammatory markers and a normal CBC. **This condition p**~~P~~resents as bone pain of insidious onset with or without localized swelling but can be multifocal and have silent areas of involvement (vertebral silent lesions can lead to compression). ~~Can approve~~ MRI **can be approved** after initial labs and x-ray. CT is not sensitive, so the next option is a bone scan.

**The American Medical Society for Sports Medicine "Choosing Wisely" Guidelines** advise against ordering a knee MRI for a patient with anterior knee pain without mechanical symptoms or effusion unless the patient has not improved following completion of an appropriate functional rehabilitation program. "The most common cause of anterior knee pain is patellofemoral pain syndrome. Magnetic resonance imaging (MRI) is rarely helpful in managing this syndrome. Treatment should focus on a guided exercise program to correct lumbopelvic and lower limb strength and flexibility imbalances. If pain persists, if there is recurrent swelling or if mechanical symptoms such as locking and painful clicking are present, and radiographs are non-diagnostic, an MRI may be useful **(AMSSM, 2014)."**

**The 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 orthopaedics, 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 orthopaedic surgeon to make sure the optimal studies are ordered **(AAP, 2018)."**

**POLICY HISTORY~~:~~**

| Date | Summary |
|---|---|
| May 2021 | • Added unstable syndesmotic injury<br>• Removed ankle instability<br>Added the following: navicular bone to high risk stress fracture;<br>~~Added~~ information about suspected bone infection in the setting of ulcers and neuropathy,<br>• ~~Additional information about~~ following treatment for rheumatoid arthritis<br>• Clarified that pre-operative imaging is for ~~diagnostic purposes only~~a planned surgery or procedure<br>• Included early complications of hip surgery to the post operative evaluation list |
| May 2020 | • 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.<br>• Added labral tear/posterior impingement to approvable list<br>• Added flatfoot deformity<br>• Expanded section about initial work-up of a mass<br>• Added the National Comprehensive Care Network as a reference for imaging guidance<br>• Expanded the section on stress fractures<br>• Revised the section on non or delayed union<br>• Added a section on loose bodies and synovial chondromatosis<br>• Added a pediatric section<br>• Removed Makoplasty from not approvable list<br>• Added a section about joint implants and hardware to the background section<br>• Added a section about chronic recurrent multifocal osteomyelitis to the background section<br>• Updated references |
| January 2020 | • Added 'infection of bone or joint section' previously omitted in error |
| May 2019 | • 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'.<br>• Added joint or muscle pain when x-ray completed<br>• Expanded Extremity mass indications including peripheral lymphadenopathy; and mass with increased risk for malignancy<br>• Added indications for foreign body and peripheral nerve entrapment<br>• Modified Known Cancer indication to be more broad – 'cancer staging, cancer restaging, signs or symptoms of recurrence'<br>• Expanded sections for bone fracture and 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) |

~~**Review Date:** May 2019~~

~~**Review Summary:**~~

- ~~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 joint or muscle pain when x-ray completed~~
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- ~~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 stress fractures~~
- ~~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~~
- ~~Added a section about chronic recurrent multifocal osteomyelitis to the background section~~
- ~~Updated references~~

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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.**

Reviewed / Approved by M. Atif Khalid MD M. Atif Khalid, M.D., Medical Director, Radiology

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