



CLINICAL GUIDELINES

Pediatric Musculoskeletal Imaging Policy

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eviCore healthcare Clinical Decision Support Tool Diagnostic Strategies: This tool addresses common symptoms and symptom complexes. Imaging requests for individuals with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician, specialist and/or individual's Primary Care Physician (PCP) may provide additional insight.

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PEDIATRIC MUSCULOSKELETAL IMAGING GUIDELINES

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PEDIATRIC MUSCULOSKELETAL IMAGING GUIDELINES

PEDMS-1~General Guidelines

Procedure Codes Associated with Musculoskeletal Imaging	
MRI	CPT®
Upper Extremity MRI non-joint without contrast	73218
Upper Extremity MRI non-joint with contrast (rarely used)	73219
Upper Extremity MRI non-joint without and with contrast	73220
Upper Extremity MRI joint without contrast	73221
Upper Extremity MRI joint with contrast (rarely used)	73222
Upper Extremity MRI joint without and with contrast	73223
Lower Extremity MRI non-joint without contrast	73718
Lower Extremity MRI non-joint with contrast (rarely used)	73719
Lower Extremity MRI non-joint without and with contrast	73720
Lower Extremity MRI joint without contrast	73721
Lower Extremity MRI joint with contrast (rarely used)	73722
Lower Extremity MRI joint without and with contrast	73723
Unlisted MRI procedure (for radiation planning or surgical software)	76498
MRA	CPT®
Upper Extremity MRA	73225
Lower Extremity MRA	73725
CT	CPT®
Upper Extremity CT without contrast	73200
Upper Extremity CT with contrast	73201
Upper Extremity CT without and with contrast	73202
Lower Extremity CT without contrast	73700
Lower Extremity CT with contrast	73701
Lower Extremity CT without and with contrast	73702
Bone Mineral Density CT, one or more sites, axial skeleton	77078
Bone Mineral Density CT, one or more sites, appendicular skeleton	77079
CT Guidance for Placement of Radiation Therapy Fields	77014
Unlisted CT procedure (for radiation planning or surgical software)	76497
CTA	CPT®
Upper Extremity CTA	73206
Lower Extremity CTA	73706
Nuclear Medicine	CPT®

PET Imaging; limited area (this code not used in pediatrics)	78811
PET Imaging; skull base to mid-thigh (this code not used in pediatrics)	78812
PET Imaging; whole body (this code not used in pediatrics)	78813
PET with concurrently acquired CT; limited area (this code rarely used in pediatrics)	78814
PET with concurrently acquired CT; skull base to mid-thigh	78815
PET with concurrently acquired CT; whole body	78816
Bone Marrow Imaging Limited Areas	78102
Bone Marrow Imaging Multiple Areas	78103
Bone Marrow Imaging Whole Body	78104
Nuclear Bone Scan Limited	78300
Nuclear Bone Scan Multiple Areas	78305
Nuclear Bone Scan Whole Body	78306
Bone Scan Three Phase	78315
Nuclear Bone Scan SPECT	78320
Radiopharmaceutical Imaging of Inflammatory Process Limited Area	78805
Radiopharmaceutical Imaging of Inflammatory Process Whole Body	78806
Radiopharmaceutical Imaging of Inflammatory Process SPECT	78807
DEXA Bone Densitometry, axial skeleton	77080
DEXA Bone Densitometry, peripheral skeleton	77081
Ultrasound	CPT[®]
Ultrasound, extremity, nonvascular; complete	76881
Ultrasound, extremity, nonvascular; limited, anatomic specific for focal abnormality	76882
Ultrasound, infant hips; dynamic (requiring physician manipulation)	76885
Ultrasound, infant hips; limited, static (not requiring physician manipulation)	76886
Ultrasound, axilla	76882
Ultrasound, upper back	76604
Ultrasound, lower back	76705
Ultrasound, other soft tissue areas not otherwise specified	76999
Limited bilateral noninvasive physiologic studies of upper or lower extremity arteries	93922
Complete bilateral noninvasive physiologic studies of upper or lower extremity arteries	93923
Duplex scan of upper extremity arteries or arterial bypass grafts; complete bilateral	93930
Duplex scan of upper extremity arteries or arterial bypass grafts; unilateral or limited	93931

Non-invasive physiologic studies of extremity veins, complete bilateral study	93965
Duplex scan of extremity veins including responses to compression and other maneuvers; complete bilateral study	93970
Duplex scan of extremity veins including responses to compression and other maneuvers; unilateral or limited study	93971
Duplex scan of hemodialysis access (including arterial inflow, body of access and venous outflow)	93990

PEDMS-1~General Guidelines

PEDMS-1.1 Pediatric Musculoskeletal Imaging Age Considerations

Many conditions affecting the musculoskeletal system in the pediatric population are different diagnoses than those occurring in the adult population. For those diseases which occur in both pediatric and adult populations, minor differences may exist in management due to patient age, comorbidities, and differences in disease natural history between children and adults.

- ✓ Patients age <18 years old should be imaged according to the Pediatric Musculoskeletal Imaging Guidelines, and patients age ≥18 years should be imaged according to the Musculoskeletal Imaging Guidelines, except where directed otherwise by a specific guideline section.

PEDMS-1.2 Pediatric Musculoskeletal Imaging Appropriate Clinical Evaluation and Conservative Treatment

- ✓ A recent (within 60 days) face-to-face evaluation including a detailed history, physical examination, appropriate laboratory studies, and basic imaging such as plain radiography or ultrasound should be performed prior to considering advanced imaging, unless the patient is undergoing guideline-supported scheduled follow-up imaging evaluation.
- ✓ Plain x-ray should be done prior to advanced imaging for musculoskeletal conditions to rule out those situations that do not require advanced imaging, such as osteoarthritis, acute/healing fracture, osteomyelitis, and tumors of bone amenable to biopsy or radiation therapy (in known metastatic disease), etc.
 - Even in soft tissue masses, plain x-rays are helpful in evaluating for calcium/bony deposits, e.g. myositis ossificans and invasion of bone.
- ✓ Provider-directed conservative care may include any or all of the following: R.I.C.E (rest, ice, compression, and elevation), NSAIDs (non-steroidal anti-inflammatory drugs), narcotic and non-narcotic analgesic medications, oral or injectable corticosteroids, viscosupplementation injections, a provider-directed home exercise program, cross-training, physical medicine, or immobilization by splinting/casting/bracing.
- ✓ These guidelines are based upon using advanced imaging to answer specific clinical questions that will affect patient management. Imaging is not indicated if the results will not affect patient management decisions. Standard medical practice would dictate continuing conservative therapy prior to advanced imaging in patients who are improving on current treatment programs.

- ✓ Repeat imaging studies of the same body area are not necessary solely for return-to-play decisions.
- ✓ Unless otherwise stated in a specific guideline section, repeat imaging studies of the same body area are not necessary unless there is evidence for progression of disease, new onset of disease, and/or documentation of how repeat imaging will affect patient management or treatment decisions.

PEDMS-1.3 Pediatric Musculoskeletal Imaging Modality General Considerations

- ✓ MRI
 - MRI without contrast is the preferred modality for pediatric musculoskeletal imaging unless otherwise stated in a specific guideline section, as it is superior in imaging the soft tissues and can also define physiological processes in some instances, e.g. edema, loss of circulation (AVN), and increased vascularity (tumors).
 - MRI without and with contrast is frequently recommended for evaluation of tumors, infection, post-operative evaluation, arthrography, and juvenile idiopathic arthritis, as described in the disease-specific guideline sections.
 - Due to the length of time for image acquisition and the need for stillness, anesthesia is required for almost all infants and young children (age <7 years), as well as older children with delays in development or maturity. In this patient population, MRI imaging sessions should be planned with a goal of avoiding a short-interval repeat anesthesia exposure due to insufficient information using the following considerations:
 - MRI should always be performed without and with contrast unless there is a specific contraindication to gadolinium use, since the patient already has intravenous access for anesthesia.
 - If multiple body areas are supported by eviCore guidelines for the clinical condition being evaluated, MRI of all necessary body areas should be obtained concurrently in the same anesthesia session.
 - The presence of surgical hardware or implanted devices may preclude MRI, as magnetic field distortion may limit detail in adjacent structures.
 - The selection of best examination may require coordination between the provider and the imaging service.
- ✓ CT
 - CT without contrast is generally superior to MRI for imaging bone and joint anatomy; thus it is useful for studying complex fractures (particularly of the joints, dislocations, and assessing delayed union or non-union of fractures, integration of bone graft material, if plain x-rays are equivocal).
 - CT should not be used to replace MRI in an attempt to avoid sedation unless listed as a recommended study in a specific guideline section.

- CT beam attenuation can result in “spray” artifact which can obscure adjacent details. This can occur with radiopaque material such as metal objects or dense bones.
- The selection of best examination may require coordination between the provider and the imaging service.
- ✓ **Ultrasound**
 - Ultrasound is frequently used to evaluate infants for hip dysplasia, to detect and/or aspirate joint effusion, and as an initial evaluation of extremity soft tissue masses.
 - CPT[®] codes vary by body area and presence or absence of Doppler imaging and are included in the table at the beginning of this guideline.
- ✓ **Nuclear Medicine**
 - Nuclear medicine studies are commonly used in evaluation of the peripheral musculoskeletal system, and other rare indications exist as well:
 - Bone scan (CPT[®] 78315 or CPT[®] 78320) is indicated for evaluation of suspected loosening of orthopedic prostheses when recent plain x-ray is nondiagnostic.
 - Nuclear medicine bone marrow imaging (CPT[®] codes: 78102, 78103, or 78104) is indicated for detection of ischemic or infarcted regions in sickle cell disease.
 - Triple phase bone scan (CPT[®] 78315) is indicated for evaluation of complex regional pain syndrome or reflex sympathetic dystrophy.
 - Bone scan (CPT[®] codes: 78300, 78305, 78306, 78315, or 78320) is indicated for evaluation of suspected frostbite.
 - Bone scan (CPT[®] codes: 78300, 78305, 78306, or 78320) is indicated for evaluation of Paget’s disease.
- ✓ **3D Rendering**
 - 3D Rendering indications in pediatric musculoskeletal imaging are identical to those for adult patients. See **MS-3~3D Rendering** for imaging guidelines.

The guidelines listed in this section for certain specific indications are not intended to be all-inclusive; clinical judgment remains paramount and variance from these guidelines may be appropriate and warranted for specific clinical situations.

References

1. ACR-ASER-SCBT-MP-SPR Practice Parameter for the Performance of Pediatric Computed Tomography (CT), revised 2014, available at:
http://www.acr.org/~media/ACR/Documents/PGTS/guidelines/CT_Pediatric.pdf.
2. ACR -SPR Practice Parameter for the Performance and Interpretation of Pediatric Magnetic Resonance Imaging (MRI), revised 2014, available at:
http://www.acr.org/~media/ACR/Documents/PGTS/guidelines/MRI_Pediatric.pdf.

3. ACR-SPR-SSR Practice Parameter for the Performance of Radiography of the Extremities, amended 2014, available at:
http://www.acr.org/~media/ACR/Documents/PGTS/guidelines/Extremity_Radiography.pdf.
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http://interactive.snm.org/docs/pg_ch34_0403.pdf.
9. Mehta RC and MA Wilson MA, Frostbite injury: prediction of tissue viability with triple-phase bone scanning, *Radiology* 1989; 170:511-514.
10. Drane WE, Myositis ossificans and the three phase bone scan, *AJR Am J Roentgenol* 1984; 142:179-180.

PEDMS-2~Fracture and Dislocation

- ✓ A recent (within 60 days) face-to-face evaluation including a detailed history, physical examination, and plain radiography should be performed prior to considering advanced imaging.

PEDMS-2.1 Acute Fracture

- ✓ Plain x-rays should be performed initially in any obvious or suspected acute fracture or dislocation.
 - If plain x-rays are positive, no further imaging is generally indicated except in complex (comminuted or displaced) joint fractures where MRI or CT without contrast can be approved for preoperative planning.
 - 3D Rendering may sometime be indicated for complex fracture repairs. See **MS-3~3D Rendering** for imaging guidelines.
- ✓ If plain x-rays are negative or equivocal for fracture, and fracture is still clinically suspected, CT or MRI without contrast is indicated if the results will determine immediate treatment decisions as documented by the treating physician.
- ✓ Bone scan is indicated for evaluation of suspected fracture when two x-rays are negative at least 10 days apart, using any of the following CPT® code combinations:
 - CPT® 78300, CPT® 78305, or CPT® 78306 as a single study
 - See **PEDMS-2.5 Stress/Occult Fracture** for bone scan indications

PEDMS-2.2 Joint Fracture

- ✓ CT can be approved in complex (comminuted or displaced) fractures involving a joint for preoperative planning.
- ✓ CT can be approved when there is clinical concern for delayed union or non-union of fracture or joint fusions on follow-up plain x-ray.

PEDMS-2.3 Growth Plate Injuries (Salter-Harris fractures)

- ✓ These fractures can generally be diagnosed and managed adequately with plain x-ray.
- ✓ If there is concern for delayed union or non-union of the bone, CT without contrast is indicated.
- ✓ MRI without contrast is indicated for the evaluation of a suspected physeal bar in a healing fracture or other complication of a fracture involving the growth plate, which may result in abnormal growth.

- ✓ Compressive injuries of the growth plate (Salter-Harris I) injuries may be difficult to identify on plain films, and MRI without contrast is indicated for confirmation.

PEDMS-2.4 Osteochondral or Chondral Fractures, including Osteochondritis Dissecans

- ✓ If x-rays are negative and an osteochondral fracture is still suspected, or if x-ray or clinical exam suggest an unstable osteochondral injury, either MRI without contrast, MR arthrogram, or CT arthrogram is indicated.
- ✓ If plain x-rays show a non-displaced osteochondral fragment, follow up imaging should be with plain x-rays. Advanced imaging is not necessary.
- ✓ MRI without contrast or CT without contrast is indicated when healing cannot be adequately assessed on follow up plain x-rays. Imaging is also indicated for surgical planning.

PEDMS-2.5 Stress/Occult Fracture

These fractures, almost always in weight bearing bones, can usually be adequately evaluated by history, physical exam, plain x-ray and bone scan.

- ✓ Plain x-rays should be performed before advanced imaging. Plain x-rays are often negative initially but become positive at 4 weeks in stress fractures or 14 days in occult fractures.
- ✓ Bone scan (CPT[®] 78315 or CPT[®] 78320) is indicated for evaluation of suspected stress fracture when two x-rays are negative at least 10 days apart.
- ✓ Periodic follow-up plain x-rays will usually show progressive healing.
 - CT without contrast is indicated when there is clinical concern for non-union.
- ✓ If the initial plain x-ray or bone scan fails to establish a definitive diagnosis of stress fracture and **hip, femur, or tibia stress fracture** is suspected, MRI or CT without contrast is indicated without waiting 4 weeks or obtaining follow-up plain x-rays.
- ✓ For all other suspected stress fractures, MRI or CT without contrast is indicated if follow-up plain x-rays are negative after 4 weeks of conservative therapy and stress fracture is still suspected.

PEDMS-2.6 Compartment Syndrome

- ✓ Advanced imaging is not indicated. Diagnosis is made clinically and by direct measurement of compartment pressure and is a surgical emergency.

PEDMS-2.7 Physical Child Abuse

- ✓ See **PEDMS-7~ Suspected Child Abuse** for imaging guidelines

References

1. Taljanovic MS, Daffner RH, Weissman BN et al, Chronic Hip Pain, *ACR Appropriateness Criteria*®, 2011:1-12.
2. Bruno MA, Weissman BN, Kransdorf MJ et al, Acute Hand and Wrist Trauma, *ACR Appropriateness Criteria*®, 2013:1-13.
3. Luchs JS, Flug JA, Weissman BN et al, Chronic Ankle Pain, *ACR Appropriateness Criteria*®, 2012:1-11.
4. Daffner RH, Weissman BN, Appel M et al, Stress (Fatigue/Insufficiency) Fracture, Including Sacrum, Excluding Other Vertebrae, *ACR Appropriateness Criteria*®, 2011:1-11.
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8. Meyer JS, Coley BD, Karmazyn B et al, Suspected Physical Abuse—Child, *ACR Appropriateness Criteria*®, 2012:1-11.
9. Christian CW, Crawford-Jakubiak JE, Flaherty EG et al, AAP Clinical Practice Guideline: The Evaluation of Suspected Physical Child Abuse, *Pediatrics* 2015; 135:e1337-e1354.

PEDMS-3~Soft Tissue and Bone Masses

PEDMS-3.1 General Considerations

- ✓ A recent (within 60 days) face-to-face evaluation including a detailed history, physical examination, with detailed information on the mass (including location, size, duration, solid vs. cystic, fixed vs. not fixed to bone) should be performed prior to considering advanced imaging.
- ✓ Evaluation by a surgical specialist is strongly recommended to help determine the most helpful advanced imaging studies for an individual patient.
- ✓ Plain x-rays should be performed as initial imaging. This is true even for soft tissue masses that are clearly not directly associated with osseous structures. Details such as soft tissue calcification, presence or absence of phleboliths, radiographic density, and any effect on adjacent bone are all potentially significant plain film findings that may help better identify the etiology of the mass and determine the optimal modality and contrast level when advanced imaging is indicated.
- ✓ If initial plain x-ray is negative, ultrasound (CPT[®] 76881 or CPT[®] 76882) can be approved to evaluate:
 - Ill-defined masses or areas of swelling
 - Hematomas
 - Subcutaneous lipomas with inconclusive clinical examination
 - Lipomas in other locations
 - Masses that have been present and stable for ≥ 1 year
 - Vascular malformations (see **PEDPVD-2 Vascular and Lymphatic Malformations** for imaging guidelines)
- ✓ Advanced imaging is **not** indicated for the following entities:
 - Ganglion cysts
 - Sebaceous cysts
 - Hematomas
 - Subcutaneous lipomas
 - MRI without or without and with contrast can be performed if surgery is planned.
- ✓ Lipomas in other locations (not subcutaneous) should be evaluated by MRI without and with contrast or by ultrasound (CPT[®] 76881 or CPT[®] 76882).

PEDMS-3.2 Soft Tissue Mass with Negative X-ray

- ✓ MRI without and with contrast is indicated.
 - CT without or with contrast is indicated if MRI is contraindicated.

PEDMS-3.3 Soft Tissue Mass with Calcification/Ossification on X-ray

- ✓ MRI without and with contrast is indicated.
 - CT without or with contrast is indicated if MRI is contraindicated.
- ✓ Bone scan (CPT[®] codes: 78300, 78305, 78306, 78315, or 78320) is indicated for evaluation of suspected myositis ossificans.

PEDMS-3.4 Mass Involving Bone (including lytic and blastic metastatic disease)

- ✓ Many benign bone tumors have a characteristic appearance on plain X-ray and advanced imaging is not necessary unless one of the following applies:
 - Imaging requested for preoperative planning (MRI without and with contrast and/or CT without and with contrast may be indicated).
 - MRI without and with contrast can be approved when the diagnosis is uncertain based on plain X-ray appearance.
 - CT without or with contrast can be approved if MRI is contraindicated.
 - SPECT bone scan (CPT[®] 78320) can be approved if osteoid osteoma is suspected.
- ✓ Known benign bone tumors, Osteogenic Sarcoma, and Ewing Sarcoma Family of Tumors should be imaged according to **PEDONC-9 Bone Tumors**.

References

1. Morrison WB, Weissman BN, Kransdorf MJ et al, Primary Bone Tumors, *ACR Appropriateness Criteria*[®], 2013:1-12.
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PEDMS-4~Limping Child

PEDMS-4.1 General Evaluation of the Limping Child

- ✓ This guideline primarily applies to children under the age of 6 years. It may also be applied to older children with pre-existing conditions who may not be able to communicate, such as a child with severe intellectual disability. Many of these cases will be urgent, because of the risk of adverse outcomes in delay of diagnosis.
- ✓ A recent (within 60 days) face-to-face evaluation, including a detailed history and physical examination, should be performed, which will help determine any indication for advanced imaging. Based on this clinical evaluation, the most likely etiology should be determined, usually trauma, infection, or neither trauma nor infection.

PEDMS-4.2 Limping Child with Suspected Trauma

- ✓ Plain radiographs are indicated. For children under age 4 this may require X-rays of the entire leg from hip to foot. If clinical suspicion is high for “toddler fracture” imaging may start with tibia/fibula radiographs, and if a fracture is demonstrated, additional imaging may not be required.
- ✓ If initial radiographs are negative, but limping symptoms or avoidance of weight-bearing persist, follow-up radiographs in 7-10 days are indicated.
- ✓ CT use is limited in the evaluation of the limping child with suspected trauma. Requests should be for Medical Director Review.
- ✓ MRI without contrast of the affected body area is indicated if plain films are negative and suspicion remains high for stress fractures or soft tissue injury.
- ✓ Radionuclide bone scan (CPT[®] 78300, CPT[®] 78305, or CPT[®] 78306) may be indicated in setting of a non-focal exam, especially in younger and non-verbal children. Due to relatively high radiation exposure, bone scan is reserved for high suspicion cases with negative radiographs. It is a preferred examination in a child with implanted hardware or devices precluding MRI.

PEDMS-4.3 Limping Child with Suspected Infection

- ✓ Pain localized to hip:
 - It is essential to exclude septic arthritis. Ultrasound of the hip (CPT[®] 76881 or CPT[®] 76882) is used to exclude hip joint effusion.
 - If hip joint effusion is demonstrated, hip joint fluid aspiration should be performed to distinguish infection from non-infectious etiologies.
 - If no hip joint effusion is demonstrated, plain radiographs should be obtained.

- If plain films are not diagnostic, MRI without or without and with contrast is indicated.
 - For unilateral hip use CPT[®] 73721 (without contrast) or CPT[®] 73723 (without and with contrast).
 - For bilateral hips use a single CPT[®] 73721 (without contrast) or CPT[®] 73723 (without and with contrast) and add modifier -50.
- ✓ Pain localized distal to hip:
 - Plain radiographs of the leg should be obtained. If these are not diagnostic, MRI without contrast or without and with contrast of the affected body part is indicated.
- ✓ Nonlocalized pain:
 - Plain radiographs of the spine, pelvis, and lower extremities may be necessary to localize the abnormality.
 - If plain radiography is not diagnostic and suspicion for infection remains high, whole body bone scan (CPT[®] 78306) or MRI without contrast or without and with contrast of the affected body area is indicated.

PEDMS-4.4 Limping Child with No Evidence of Trauma or Infection

- ✓ This differential diagnosis is quite broad.
 - Transient (or toxic) synovitis of the hip:
 - Ultrasound of the hip (CPT[®] 76881 or CPT[®] 76882) is the preferred initial exam.
 - If no hip effusion is demonstrated, plain radiographs should be obtained.
 - If a hip joint effusion is demonstrated, hip joint fluid aspiration is indicated. This is usually performed with US guidance, though fluoroscopic guidance or blind aspiration may be required.
 - Avascular Necrosis: See **PEDMS-6~Avascular Necrosis (AVN/Legg-Calvé-Perthes Disease**
 - Juvenile Idiopathic Arthritis: See **PEDMS-10~Juvenile Idiopathic Arthritis**
 - Histiocytic Disorders: See **PEDONC-18~Pediatric Histiocytic Disorders**
 - Neoplasm: See **PEDONC-1~General Guidelines, PEDONC-3~Pediatric Leukemias, PEDONC-6, Neuroblastoma, PEDONC-8 Pediatric Soft Tissue Sarcomas, or PEDONC-9~Bone Tumors**, Child abuse: See **PEDMS-7~Suspected Child Abuse**

References

1. Milla SS, Coley BD, Karmazyn B et al, Limping Child—Ages 0-5 Years, *ACR Appropriateness Criteria*[®], 2012:1-11.
2. Herman MJ and Martinek M, The Limping Child, *Pediatr Rev* 2015; 36:184-197.

PEDMS-5~Developmental Dysplasia of the Hip

Developmental dysplasia of the hip (DDH) was formerly known as congenital dislocation of the hip. DDH includes a spectrum of abnormalities including abnormal acetabular shape (dysplasia) and malposition of the femoral head ranging from mild subluxation, dislocatable hip to fixed dislocation. 60-80% of abnormalities are identified by physical exam, and more than 90% are identified by ultrasound. Treatment may involve placement in a Pavlik harness, casting, or surgery in extreme or refractory cases.

Screening studies:

- ✓ The routine use of ultrasound in screening neonates and infants without risk factors for DDH is not recommended by the American Academy of Pediatrics and the American Academy of Orthopedic Surgeons.
- ✓ Screening ultrasound (CPT[®] 76885 or CPT[®] 76886) is recommended for infants 4 to 6 weeks of age with one or more of the following risk factors:
 - Breech presentation
 - Family history of DDH
 - Abnormal hip exam (e.g. positive Ortolani or Barlow maneuvers, asymmetric thigh folds, shortening of the thigh observed on the dislocated side, limitation of hip abduction).
- ✓ Indications for follow-up hip ultrasound (CPT[®] 76885 or CPT[®] 76886):
 - Type IIa hip was diagnosed on a previous hip ultrasound using the Graf method and follow-up hip ultrasound is requested to confirm normal development.
 - Graf type IIa hip has an alpha angle (bony angle) between 50-59 degrees in a child less than 3 months of age.
 - The overwhelming majority of these hips mature spontaneously, but follow-up may be required to ensure that maturation has occurred.
 - Full description of the Graf classification can be found at: <http://radiopaedia.org/articles/ultrasound-classification-of-developmental-dysplasia-of-the-hip-1>.
 - Prior ultrasound demonstrates abnormal hip and treatment has been applied, such as a Pavlik harness or other device. Follow-up ultrasound is indicated to document effectiveness of treatment, to ensure the femoral head remains located in the acetabulum or to identify treatment failure. The usual interval for follow-up sonography is monthly, but earlier imaging is indicated for clinical suspicion of treatment failure, subluxation or dislocation of the hip.

- ✓ MRI without contrast or CT without contrast is indicated to evaluate alignment following reduction. Children in casts or following surgery may require repeated advanced imaging to ensure the reduction remains satisfactory, or to assess incorporation of bone graft material.
 - For unilateral hip MRI use CPT[®] 73721
 - For bilateral hips MRI use a single CPT[®] 73721 and add modifier -50
 - For unilateral hip CT use CPT[®] 73700
 - For bilateral hips CT use a single CPT[®] 73700 and add modifier -50
- ✓ Hip ultrasound is **NOT** indicated for the following:
 - Infants less than 2 weeks of age as hip laxity is normal after birth and usually resolves spontaneously.
 - Infants older than 6 months of age as plain x-ray of the hips become more reliable due to femoral head ossification and should be used in infants over 6 months of age.
 - Type I, IIb, IIc, IId, and III hips diagnosed on a previous hip ultrasound using the Graf method. Type I hip is normal, and Type IIb, IIc, IId, and III require referral for treatment rather than follow-up imaging.
 - Plain x-ray of the hips should be performed rather than ultrasound if there is a clinical suspicion for teratogenic dysplasia.

References

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PEDMS-6~Avascular Necrosis (AVN) / Legg-Calvé-Perthes Disease / Idiopathic Osteonecrosis

Legg-Calvé-Perthes Disease (LCP) is idiopathic osteonecrosis (AVN) of the femoral head. This may occur in children when the femoral head loses its blood supply. It most commonly affects children between the ages of 4 and 8 (occasionally younger or older). Clinically, LCP is quite different than adult AVN since there is good healing potential of the femoral head, especially in younger children. Treatment is observation in mild cases and containment of the head within the acetabulum by abduction bracing or occasionally surgery in more severe cases.

- ✓ A recent (within 60 days) face-to-face evaluation including a detailed history, physical examination, and plain radiography should be performed prior to considering advanced imaging, unless the patient is undergoing guideline-supported scheduled follow-up imaging evaluation.

PEDMS-6.1 Avascular Necrosis and Legg-Calvé-Perthes Disease

- ✓ Plain x-ray is the initial imaging study and may be all that is necessary for follow-up.
- ✓ If the diagnosis is uncertain on plain x-ray, hip MRI either without contrast or without and with contrast is indicated.
 - For unilateral hip use CPT[®] 73721 (without contrast) or CPT[®] 73723 (without and with contrast).
 - For bilateral hips use a single CPT[®] 73721 (without contrast) or CPT[®] 73723 (without and with contrast) and add modifier -50
 - If MRI is contraindicated or unavailable, any one of the following studies may be approved in lieu of MRI:
 - Nuclear bone scan (CPT[®] codes: 78300, 78305, 78306, or 78320)
 - Nuclear medicine bone marrow imaging (CPT[®] codes: 78102, 78103, or 78104)

PEDMS-6.2 Osteonecrosis

- ✓ Osteonecrosis can occur in a number of conditions, including during treatment for developmental dysplasia of the hip.
- ✓ Patients with acute lymphoblastic leukemia, lymphoblastic lymphoma, or other conditions with recurrent exposure to high dose corticosteroids and known or suspected osteonecrosis should be imaged according to guidelines in:

PEDONC-3.2 Acute Lymphoblastic Leukemia.

- ✓ Known or suspected osteonecrosis in long term cancer survivors should be imaged according to guidelines in: **PEDONC-19.4 Osteonecrosis in Long Term Cancer Survivors.**

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PEDMS-7~Suspected Physical Child Abuse

The suspicion of physical abuse of a child often requires imaging, both for clinical management and for forensic purposes. Every effort should be made to support reasonable requests for imaging in these children.

Child abuse injuries may affect any organ or system. Fractures are common, but injuries may also include solid and hollow visceral organs, superficial and deep soft tissue injuries, or burns. Some fracture patterns are highly correlated with non-accidental mechanisms, such as the “classic metaphyseal lesion,” also known as a corner fracture or bucket handle fracture, but fractures may occur in any bone. Unsuspected fractures, multiple fractures at various stages of healing, or fractures of a configuration or distribution inconsistent with the history provided, may raise the suspicion for physical abuse.

Skeletal Injury

- ✓ The radiographic skeletal survey is the primary imaging procedure for detecting fractures, especially in children age 24 months or younger. In older children, skeletal survey may be indicated, but more tailored radiographic evaluation based on history and physical examination may be preferable to skeletal survey.
- ✓ Bone scan (CPT[®] codes: 78300, 78305, 78306, or 78320) is complimentary to plain radiographs, and may be used when the skeletal survey is negative but clinical suspicion remains high.
- ✓ Suspected injury to the spine should usually first be evaluated with plain radiographs. CT without contrast and/or MRI without contrast or without and with contrast may be required for complete evaluation of osseous and soft tissue spine injuries. If requested for suspected or known physical abuse, both CT and MRI should be approved.

Head Injury

- ✓ CT Head without contrast (CPT[®] 70450) is indicated when there is clinical evidence of head injury or when skull fracture of any age is detected on survey skull x-ray.
 - CT Head without contrast (CPT[®] 70450) is also indicated when known or suspected cervical trauma is present in a pediatric patient.

- ✓ MRI Brain without contrast (CPT[®] 70551) or without and with contrast (CPT[®] 70553) is indicated to further evaluate brain parenchymal injury, or in a child where the clinical signs of brain injury are not sufficiently explained by CT findings.
- ✓ Infants may require advanced imaging even if no neurologic symptoms are detected due to the great potential morbidity of abusive head trauma.

Other Body Area Injuries

- ✓ CT should be performed with IV contrast unless an absolute contraindication exists.
- ✓ Any of the following imaging studies are indicated for suspected injury to the abdomen or pelvis:
 - Abdominal ultrasound (CPT[®] 76700)
 - Pelvic ultrasound (CPT[®] 76856)
 - CT Abdomen with contrast (CPT[®] 74160)
 - CT Pelvis with contrast (CPT[®] 72193)
 - CT Abdomen/Pelvis with contrast (CPT[®] 74177)
- ✓ Any of the following imaging studies are indicated for suspected injury to the chest:
 - CT Chest without contrast (CPT[®] 71250)
 - CT Chest with contrast (CPT[®] 71260)

Screening of other children

- ✓ A skeletal survey, or other imaging, may be requested for siblings of abused children, or for other household members under the age of two due to the high incidence of occult fractures in these children. All such requests should be approved.

References

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3. Christian CW, Crawford-Jakubiak JE, Flaherty EG et al, AAP Clinical Practice Guideline: The Evaluation of Suspected Physical Child Abuse, *Pediatrics* 2015; 135:e1337-e1354.

PEDMS-8~Infection/Osteomyelitis

- ✓ Infection and osteomyelitis imaging indications in pediatric patients are identical to those for adult patients other than the limping child.
 - See **MS-9 Infection/Osteomyelitis** for imaging guidelines other than in the limping child.
 - See **PEDMS-4.3 Limping Child with Suspected Infection** for imaging guidelines when limping is present.
 - See **PEDMS-10~Inflammatory Musculoskeletal Disease** for imaging guidelines for chronic recurrent multifocal osteomyelitis (CRMO, which is an autoimmune disease).
- ✓ Any of the following studies are indicated for initial evaluation of suspected osteomyelitis as well as evaluation of response to treatment in established osteomyelitis:
 - Bone scan (one of CPT[®] codes: 78300, 78305, 78306, or 78315)
 - Nuclear Bone Marrow imaging (one of CPT[®] codes: 78102, 78103, or 78104)
 - Radiopharmaceutical inflammatory imaging (one of CPT[®] codes: 78805, 78806, or 78807)
- ✓ Bone scan (one of CPT[®] codes: 78300, 78305, 78306, or 78315) is indicated for initial evaluation of suspected osteomyelitis as well as evaluation of response to treatment in established osteomyelitis.

References

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PEDIATRIC MUSCULOSKELETAL IMAGING GUIDELINES

PEDMS-9~Foreign Body

- ✓ Foreign body imaging indications in pediatric patients are identical to those for adult patients. See **MS-6.1 Foreign Body – General** for imaging guidelines.

PEDMS-10~Inflammatory Musculoskeletal Disease

PEDMS-10.1 Juvenile Idiopathic Arthritis

- ✓ A recent (within 60 days) face-to-face evaluation including a detailed history, physical examination, and plain radiography should be performed prior to considering advanced imaging.
- ✓ Inflammatory arthritis imaging indications in pediatric patients are very similar to those for adult patients. See **MS-15~Rheumatoid Arthritis and Inflammatory Arthritis** for imaging guidelines.
- ✓ SPECT bone scan (CPT[®] 78320) is indicated for evaluation of facet arthropathy in patients with ankylosing spondylitis, osteoarthritis, or rheumatoid arthritis.
- ✓ Pediatric-specific imaging considerations include the following:
 - MRI without and with contrast of the most symptomatic joint should be approved for evaluation of suspected or known synovitis when MRI findings will result in a change in therapy.

PEDMS-10.2 Chronic Recurrent Multifocal Arthritis

Chronic recurrent multifocal osteomyelitis (CRMO) is a rare autoimmune disease affecting multiple bones, arising most commonly during the second decade of life. Treatment consists of anti-inflammatory and immunomodulatory therapies, and is directed predominantly by status of clinical symptoms (most commonly pain).

- ✓ Patients with CRMO can have the following imaging approved for evaluation of new or worsening pain, or response to treatment in patients without complete clinical resolution of pain symptoms, when plain x-rays are non-diagnostic:
 - Bone scan (CPT[®] codes: 78300, 78305, 78306, 78315, or 78320)
 - Nuclear Bone Marrow imaging (CPT[®] codes: 78102, 78103, or 78104), OR
 - Radiopharmaceutical inflammatory imaging (CPT[®] codes: 78805, 78806, or 78807)
 - MRI without contrast of specific painful body areas when plain x-ray and bone scan are insufficient to direct acute patient care decisions.
 - Whole body MRI is considered investigational for CRMO at this time due to lack of standardization in technique and lack of published evidence showing improvement in patient outcomes over monitoring with clinical symptoms, plain radiography, and bone scan. See **Preface 5.2~Whole Body MR Imaging** for additional details.

PEDMS-10.3 Inflammatory Muscle Diseases

- ✓ A recent (within 60 days) face-to-face evaluation including a detailed history, physical examination, and plain radiography should be performed prior to considering advanced imaging.

Inflammatory Muscle Diseases:

These include dermatomyositis, polymyositis, and sporadic inclusion body myositis. MRI without contrast of a single site is indicated in these disorders for the following purposes:

- ✓ Selection of biopsy site
- ✓ Treatment monitoring
- ✓ Detection of occult malignancy

Juvenile Dermatomyositis:

- ✓ MRI without contrast can frequently confirm the diagnosis and thus avoid a biopsy.
- ✓ CT without contrast (CPT[®] 73700) is indicated to follow progressive calcification in muscles, but MRI (CPT[®] 73718) is often used instead since it permits assessment of the primary muscle disease as well.
 - Both CT and MRI are rarely indicated concurrently, and these requests should be forwarded for medical director review.
- ✓ Contrary to adult dermatomyositis, juvenile dermatomyositis is very rarely paraneoplastic in nature, and routine screening for occult neoplasm is not indicated.
 - For patients with palpable lymphadenopathy or hepatosplenomegaly, CT Chest (CPT[®] 71260) and Abdomen/Pelvis (CPT[®] 74177) with contrast are indicated.

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PEDMS-11~Muscle/Tendon Unit Injuries

- ✓ Muscle and tendon unit injury imaging indications in pediatric patients are identical to those for adult patients. See **MS-11 Muscle/Tendon Unit Injuries/Diseases-General** for imaging guidelines.

PEDMS-12~Osgood-Schlatter Disease

This is defined as traction apophysitis of the tibial tubercle in skeletally immature individuals. Diagnosis is by clinical examination and x-ray, and treatment is conservative.

Advanced imaging is not indicated in this disorder.

References

1. Wells L and Sehgal K, Osgood-Schlatter Disease, *Nelson Textbook of Pediatrics*, eds Kliegman RM, Stanton BF, Schor NF, St. Geme JW III, and Behrman RE, 19th edition 2011, pp 2353-2354.
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PEDMS-13~Popliteal (Baker) Cyst

Popliteal or Baker cyst in children is a different clinical entity than in adults and is almost never due to intra-articular pathology. These lesions are usually treated conservatively and rarely require surgery.

- ✓ Ultrasound (CPT[®] 76881 or CPT[®] 76882) is the appropriate initial imaging study.
- ✓ MRI without contrast (CPT[®] 73721) is indicated for preoperative planning or if ultrasound is non-diagnostic.

References

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http://www.wheelessonline.com/ortho/bakers_cyst_popliteal_cysts.

PEDMS-14~Slipped Capital Femoral Epiphysis (SCFE)

Slipped capital femoral epiphysis (SCFE) should be considered in young adolescents or preadolescents with groin, anterior thigh, or atraumatic knee pain. Symptoms often include a history of intermittent limp and pain for several weeks or months that are often poorly localized to the thigh, groin, or knee. Any obese adolescent or preadolescent presenting with a history of a limp and thigh, knee, or groin pain for several weeks to one month should be presumed to have a slipped capital femoral epiphysis (SCFE).

Imaging studies:

- ✓ Anteroposterior and lateral x-rays (frog leg or cross table lateral) of both hips will confirm or exclude the diagnosis.
 - If clinical suspicion remains after negative plain films, MRI without contrast (CPT[®] 73721) or without and with contrast (CPT[®] 73723) is indicated to detect widening of the physis before the femoral head is displaced (pre-slip).
- ✓ Because a significant percentage of SCFE is bilateral at presentation, it is reasonable to evaluate the contralateral hip if requested, as some surgeons advocate surgical treatment of pre-slip. All bilateral hip requests should be forwarded for Medical Director Review.
 - For unilateral hip use CPT[®] 73721 (without contrast) or CPT[®] 73723 (without and with contrast).
 - For bilateral hips use a single CPT[®] 73721 (without contrast) or CPT[®] 73723 (without and with contrast) and add modifier -50.
- ✓ If MRI was not completed for diagnosis, MRI without contrast is indicated for preoperative planning.

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PEDMS-15~Limb Length Discrepancy

- ✓ Limb length discrepancy imaging indications in pediatric patients are identical to those for adult patients. See **MS-17.1 Limb Length Discrepancy** for imaging guidelines.

PEDMS-16~Congenital Anomalies of the Foot

PEDMS-16.1 Tarsal Coalition (Calcaneonavicular Bar/Rigid Flat Foot)

- ✓ Plain x-rays should be performed initially since the calcaneonavicular bar is readily visible in older children and adults.
 - Talocalcaneal coalition is more difficult to evaluate on plain x-rays.
- ✓ If tarsal coalition is suspected (because of restricted hindfoot motion on physical exam), and plain x-rays are negative, CT without contrast (CPT[®] 73700) or MRI without contrast (CPT[®] 73718) is indicated.

PEDMS-16.2 Club Foot

Club Foot is a congenital foot contracture with foot in equinus (plantar flexion) and heel and forefoot in varus/adduction (turned in). Immediate diagnosis and specialty evaluation in the first week of life provide the best chance for successful correction.

- ✓ MRI without contrast (CPT[®] 73718) or CT without contrast (CPT[®] 73700) is indicated as a preoperative evaluation.

References

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