

# CIGNA MEDICAL COVERAGE POLICIES - RADIOLOGY

## Pediatric Musculoskeletal Imaging Guidelines

Effective Date: February 1, 2025



---

### Instructions for use

The following coverage policy applies to health benefit plans administered by Cigna. Coverage policies are intended to provide guidance in interpreting certain standard Cigna benefit plans and are used by medical directors and other health care professionals in making medical necessity and other coverage determinations. Please note the terms of a customer's particular benefit plan document may differ significantly from the standard benefit plans upon which these coverage policies are based. For example, a customer's benefit plan document may contain a specific exclusion related to a topic addressed in a coverage policy.

In the event of a conflict, a customer's benefit plan document always supersedes the information in the coverage policy. In the absence of federal or state coverage mandates, benefits are ultimately determined by the terms of the applicable benefit plan document. Coverage determinations in each specific instance require consideration of:

1. The terms of the applicable benefit plan document in effect on the date of service
2. Any applicable laws and regulations
3. Any relevant collateral source materials including coverage policies
4. The specific facts of the particular situation

Coverage policies relate exclusively to the administration of health benefit plans. Coverage policies are not recommendations for treatment and should never be used as treatment guidelines.

This evidence-based medical coverage policy has been developed by EviCore, Inc. Some information in this coverage policy may not apply to all benefit plans administered by Cigna.

These guidelines include procedures EviCore does not review for Cigna. Please refer to the **Cigna CPT code list** for the current list of high-tech imaging procedures that EviCore reviews for Cigna.

CPT® (Current Procedural Terminology) is a registered trademark of the American Medical Association (AMA). CPT® five-digit codes, nomenclature and other data are copyright 2024 American Medical Association. All Rights Reserved. No fee schedules, basic units, relative values or related listings are included in the CPT book. AMA does not directly or indirectly practice medicine or dispense medical services. AMA assumes no liability for the data contained herein or not contained herein.

# Table of Contents

Guideline	Page
<b>General Guidelines (PEDMS-1.0)</b> .....	<b>3</b>
<b>Fracture and Dislocation (PEDMS-2)</b> .....	<b>13</b>
<b>Soft Tissue and Bone Masses (PEDMS-3)</b> .....	<b>23</b>
<b>Limping Child (PEDMS-4)</b> .....	<b>29</b>
<b>Developmental Dysplasia of the Hip (PEDMS-5)</b> .....	<b>35</b>
<b>Avascular Necrosis (AVN) / Legg-Calvé-Perthes Disease / Idiopathic Osteonecrosis (PEDMS-6)</b> .....	<b>39</b>
<b>Suspected Physical Child Abuse (PEDMS-7)</b> .....	<b>43</b>
<b>Infection/Osteomyelitis (PEDMS-8)</b> .....	<b>47</b>
<b>Foreign Body (PEDMS-9)</b> .....	<b>50</b>
<b>Inflammatory Musculoskeletal Disease (PEDMS-10)</b> .....	<b>53</b>
<b>Muscle/Tendon Unit Injuries (PEDMS-11)</b> .....	<b>60</b>
<b>Osgood-Schlatter Disease (PEDMS-12)</b> .....	<b>62</b>
<b>Popliteal (Baker) Cyst (PEDMS-13)</b> .....	<b>65</b>
<b>Slipped Capital Femoral Epiphysis (SCFE) (PEDMS-14)</b> .....	<b>68</b>
<b>Limb Length Discrepancy (PEDMS-15)</b> .....	<b>71</b>
<b>Congenital Anomalies of the Foot and Lower Extremity (PEDMS-16)</b> .....	<b>73</b>

# General Guidelines (PEDMS-1.0)

---

Guideline	Page
Procedure Codes Associated with Musculoskeletal Imaging (PEDMS).....	4
General Guidelines (PEDMS-1.0).....	7
Age Considerations (PEDMS-1.1).....	8
Appropriate Clinical Evaluation and Conservative Treatment (PEDMS-1.2).....	9
Modality General Considerations (PEDMS-1.3).....	10
References (PEDMS-1).....	12

# Procedure Codes Associated with Musculoskeletal Imaging (PEDMS)

MSP.GG.ProcedureCodes.C

v1.0.2025

MRI	CPT®
MRI Upper Extremity non-joint without contrast	73218
MRI Upper Extremity non-joint with contrast (rarely used)	73219
MRI Upper Extremity non-joint without and with contrast	73220
MRI Upper Extremity joint without contrast	73221
MRI Upper Extremity joint with contrast (rarely used)	73222
MRI Upper Extremity joint without and with contrast	73223
MRI Lower Extremity non-joint without contrast	73718
MRI Lower Extremity non-joint with contrast (rarely used)	73719
MRI Lower Extremity non-joint without and with contrast	73720
MRI Lower Extremity joint without contrast	73721
MRI Lower Extremity joint with contrast (rarely used)	73722
MRI Lower Extremity joint without and with contrast	73723
Unlisted MRI procedure (for radiation planning or surgical software)	76498

MRA	CPT®
MRA Upper Extremity	73225

MRA	CPT <sup>®</sup>
MRA Lower Extremity	73725

CT	CPT <sup>®</sup>
CT Upper Extremity without contrast	73200
CT Upper Extremity with contrast	73201
CT Upper Extremity without and with contrast	73202
CT Lower Extremity without contrast	73700
CT Lower Extremity with contrast	73701
CT Lower Extremity without and with contrast	73702
CT Chest without contrast	71250
CT Chest with contrast	71260
CT Abdomen with contrast	74160
CT Pelvis with contrast	72193
CT Abdomen and Pelvis with contrast	74177
Bone Mineral Density CT, on or more sites, axial skeleton	77078
CT Guidance for Placement of Radiation Therapy Fields	77014
Unlisted CT procedure (for radiation planning or surgical software)	76497

CTA	CPT <sup>®</sup>
CTA Upper Extremity	73206
CTA Lower Extremity	73706

Ultrasound	CPT <sup>®</sup>
Ultrasound, extremity, nonvascular; complete joint	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
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

# General Guidelines (PEDMS-1.0)

MSP.GG.0001.0.A

v1.0.2025

- A pertinent clinical evaluation including a detailed history, physical examination, appropriate laboratory studies and basic imaging such as plain x-ray or ultrasound should be performed prior to considering advanced imaging (CT, MR, Nuclear Medicine), unless the individual is undergoing guideline-supported scheduled imaging evaluation. A meaningful technological contact (telehealth visit, telephone call, electronic mail or messaging) can serve as a pertinent clinical evaluation.
- Plain x-ray should be done prior to advanced imaging. The results of plain x-rays performed after the current episode of symptoms started or changed need to be available to the requesting provider of the advanced imaging study. X-ray can rule out those situations that do not require advanced imaging, such as 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.
- 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 individual management or treatment decisions.
- 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 individual management decisions. Standard medical practice would dictate continuing conservative therapy prior to advanced imaging in individuals who are improving on current treatment programs.

# Age Considerations (PEDMS-1.1)

MSP.GG.0001.1.A

v1.0.2025

- 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, differences may exist in management due to individual age, comorbidities, and differences in disease natural history between children and adults.
- Individuals who are  $\leq 18$  years old should be imaged according to the Pediatric Musculoskeletal Imaging Guidelines if discussed<sup>15</sup>. Any conditions not specifically discussed in the Pediatric Musculoskeletal Imaging Guidelines should be imaged according to the General Musculoskeletal Imaging Guidelines. Individuals who are  $>18$  years old should be imaged according to the General Musculoskeletal Imaging Guidelines except where directed otherwise by a specific guideline section.



# Appropriate Clinical Evaluation and Conservative Treatment (PEDMS-1.2)

---

MSP.GG.0001.2.A

v1.0.2025

- See: General Guidelines (PEDMS-1.0)

# Modality General Considerations (PEDMS-1.3)

MSP.GG.0001.3.C

v1.0.2025

- 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 required for MRI acquisition and the need to minimize patient movement, anesthesia is usually required for almost all infants (except neonates) and young children (age <7 years), as well as older children with delays in development or maturity. This anesthesia may be administered via oral or intravenous route. In this individual population, MRI sessions should be planned with a goal of minimizing anesthesia exposure by adhering to the following considerations:
    - MRI procedures can be performed without and/or with contrast as supported by these condition-based guidelines. If intravenous access will already be present for anesthesia administration and there is no contraindication for using contrast, imaging without and with contrast may be appropriate if requested. By doing so, the requesting provider may avoid repetitive anesthesia administration to perform an MRI with contrast if the initial study without contrast is inconclusive.
      - Evidence-based literature demonstrates the potential for gadolinium deposition in various organs including the brain, after the use of MRI contrast.
      - The U.S. Food and Drug Administration (FDA) has noted that there is currently no evidence to suggest that gadolinium retention in the brain is harmful and restricting gadolinium-based contrast agents (GBCAs) use is not warranted at this time. It has been recommended that GBCA use should be limited to circumstances in which additional information provided by the contrast agent is necessary and the necessity of repetitive MRIs with GBCAs should be assessed.
    - If multiple body areas are supported by these guidelines for the clinical condition being evaluated, MRI of all necessary body areas should be obtained concurrently in the same imaging session.

- The presence of surgical hardware or implanted devices may preclude MRI, as magnetic field distortion may limit detail in adjacent structures. CT may be the procedure of choice in these cases.
- 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 streak 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 requesting provider and the rendering imaging facility.
- 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<sup>®</sup> codes vary by body area and the use of Doppler imaging. These CPT<sup>®</sup> codes are included in the table at the beginning of this guideline.
- 3D Rendering
  - 3D Rendering indications in pediatric musculoskeletal imaging are identical to those in the general imaging guidelines. See: **3D Rendering (MS-3)** 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 (PEDMS-1)

**v1.0.2025**

1. ACR–ASER–SCBT–MR–SPR Practice Parameter for the performance of pediatric computed tomography (CT). Revised 2019 (Resolution 6). <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/CT-Ped.pdf?la=en>
2. ACR–SPR–SSR Practice Parameter for the performance of radiography of the extremities. Revised 2018 (Resolution 6). <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Rad-Extremity.pdf?la=en>
3. ACR Practice Parameter for performing and interpreting magnetic resonance imaging (MRI). Revised 2022 (Resolution 8). <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/MR-Perf-Interpret.pdf>
4. Biassoni L, Easty M. Paediatric nuclear medicine imaging. *Br Med Bull*. 2017;123(1):127-148. doi:10.1093/bmb/ldx025.
5. Ing C, DiMaggio C, Whitehouse A, et al. Long-term differences in language and cognitive function after childhood exposure to anesthesia. *Pediatrics*. 2012;130(3):e476-e485. doi:10.1542/peds.2011-3822d.
6. Monteleone M, Khandji A, Cappell J, et al. Anesthesia in children: perspectives from nonsurgical pediatric specialists. *J Neurosurg Anesthesiol*. 2014;26(4):396-398. doi:10.1097/ana.000000000000124.
7. DiMaggio C, Sun LS, Li G. Early Childhood exposure to anesthesia and risk of developmental and behavioral disorders in a sibling birth cohort. *Anesth Analg*. 2011;113(5):1143-1151. doi:10.1213/ane.0b013e3182147f42.
8. Hindorf C, Glatting G, Chiesa C, et al. EANM Dosimetry committee guidelines for bone marrow and whole body dosimetry. *Eur J Nucl Med Mol Imaging*. 2010;37(6):1238-1250. doi:10.1007/s00259-010-1422-4.
9. Hryhorczuk AL, Restropo R. Pediatric musculoskeletal ultrasound: practical imaging approach. *AJR*. 2016;206:W62-W72. doi:10.2214/AJR.15.15858.
10. Fraum TJ, Ludwig DR, Bashir MR, et al. Gadolinium-based contrast agents: a comprehensive risk assessment. *J Magn. Reson. Imaging*. 2017;46(2):338–353. doi:10.1002/jmri.25625.
11. FDA Medical Imaging Drug Advisory Committee meeting 9/8/17 Minutes available at: <https://www.fda.gov/downloads/AdvisoryCommittees/CommitteesMeetingMaterials/Drugs/MedicalImagingDrugsAdvisoryCommittee/UCM574746.pdf>.
12. Eutsler EP, Siegel MJ. Musculoskeletal system and vascular imaging. In: Siegel MJ eds. *Pediatric sonography*. 5<sup>th</sup> ed. Philadelphia, PA: Wolters Kluwer; 2018:601-642.
13. Fotenos, A. *Update on FDA approach to safety issue of gadolinium retention after administration of gadolinium-based contrast agents*. FDA. <https://www.fda.gov/media/116492/download>. Accessed April 22, 2020.
14. Blumfield E, Swenson DW, Iyer RS, Stanescu AL. Gadolinium-based contrast agents – review of recent literature on magnetic resonance imaging signal intensity changes and tissue deposits, with emphasis on pediatric patients. *Pediatric Radiology*. 2019;49(4):448-457. doi:10.1007/s00247-018-4304-8.
15. Implementation Guide: Medicaid State Plan Eligibility Eligibility Groups Mandatory Coverage Infants and Children under Age 19 Guidance Portal. <https://www.hhs.gov/guidance/document/implementation-guide-medicaid-state-plan-eligibility-eligibility-groups-aeu-mandatory-2>.

# Fracture and Dislocation (PEDMS-2)

Guideline	Page
Fracture and Dislocation (PEDMS-2).....	14
Acute Fracture (PEDMS-2.1).....	15
Joint-Adjacent Fracture (PEDMS-2.2).....	16
Growth Plate Injuries (Salter-Harris Fractures) (PEDMS-2.3).....	17
Osteochondral or Chondral Fractures, Including Osteochondritis Dissecans (PEDMS-2.4).....	18
Stress/Occult Fracture (PEDMS-2.5).....	19
Compartment Syndrome (PEDMS-2.6).....	20
Physical Child Abuse (PEDMS-2.7).....	21
References (PEDMS-2).....	22

# Fracture and Dislocation (PEDMS-2)

MSP.FX.0002.0.A

v1.0.2025

- A pertinent clinical evaluation including a detailed history, physical examination, and plain x-ray should be performed prior to considering advanced imaging.

# Acute Fracture (PEDMS-2.1)

MSP.FX.0002.1.C

v1.0.2025

- 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 sometimes be indicated for complex fracture repairs. See: **3D Rendering (MS-3)** in the Musculoskeletal Imaging Guidelines.
- Ultrasound (CPT<sup>®</sup> 76881 or CPT<sup>®</sup> 76882) may be approved for evaluation of fracture, but is not required to allow for other advanced imaging,<sup>12</sup> especially in infants.<sup>13</sup> Ultrasound is typically a secondary method of fracture detection when used, though some centers use it as the sole imaging modality for skull and clavicle fractures.<sup>15</sup>
- CT or MRI without contrast is indicated if plain x-rays are negative or equivocal for fracture, and fracture or bone marrow edema is still clinically suspected, and if the results will determine immediate treatment decisions as documented by the treating physician.<sup>12</sup>

# Joint-Adjacent Fracture (PEDMS-2.2)

MSP.FX.0002.2.A

v1.0.2025

- CT without contrast can be approved in complex (comminuted or displaced) fractures seen on plain x-ray involving a joint for preoperative planning.
- CT without contrast 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.



# Growth Plate Injuries (Salter-Harris Fractures) (PEDMS-2.3)

MSP.FX.0002.3.C

v1.0.2025

- These fractures can generally be diagnosed and managed adequately with plain x-ray.<sup>14</sup>
- If there is concern for delayed union or non-union of the bone seen on plain x-ray, 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 seen on plain x-ray or CT which may result in abnormal growth.<sup>14</sup> While physeal bars may be seen on CT, some fibrous physeal bars can be missed on CT. As such, MRI is the preferred imaging modality.<sup>13</sup>
- Compressive injuries of the growth plate (Salter-Harris V) injuries may be difficult to identify on plain films, and MRI without contrast is indicated for confirmation.<sup>14</sup>

# Osteochondral or Chondral Fractures, Including Osteochondritis Dissecans (PEDMS-2.4)

MSP.FX.0002.4.C

v1.0.2025

- If x-rays are negative and an osteochondral fracture is still suspected, or if x-ray or clinical exam suggests an unstable osteochondral injury, either MRI without contrast, MR arthrogram, or CT arthrogram of the involved joint 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.<sup>10</sup>

## Background and Supporting Information

An osteochondral fracture is a tear of the cartilage which covers the end of a bone, within a joint. It is also known as Osteochondritis Dissecans. In both disorders, the osteochondral fragment may separate from the articular surface and form loose bone fragments in a joint.

## Stress/Occult Fracture (PEDMS-2.5)

MSP.FX.0002.5.C

v1.0.2025

- These fractures can usually be adequately evaluated by history, physical exam, and x-ray. Advanced imaging may be appropriate as discussed below if the initial evaluation of history, physical exam, and plain x-ray fails to establish a definitive diagnosis.
- Plain x-rays should be performed before advanced imaging. Plain x-rays are often negative initially, but may become positive after 14 days.
- If stress or occult fracture is suspected involving the pelvis, sacrum, hip, femur, tibia, tarsal navicular, proximal 5<sup>th</sup> metatarsal, or scaphoid, and initial plain x-ray fails to establish a definitive diagnosis:
  - MRI or CT without contrast is indicated, without conservative care or follow-up plain x-rays
- For all other suspected stress or occult fractures, if follow-up plain x-rays are negative after 10 days of conservative care, or initial non-diagnostic x-ray is obtained a minimum of 14 days after the onset of symptoms:
  - MRI or CT without contrast is indicated
- Periodic follow-up plain x-rays will usually show progressive healing.
  - CT without contrast is indicated when there is clinical concern for non-union.

# Compartment Syndrome (PEDMS-2.6)

MSP.FX.0002.6.A

v1.0.2025

- Acute compartment syndrome is a clinical diagnosis made by direct measurement of compartment pressure and is a surgical emergency. Advanced imaging is not indicated.
- See: **Chronic Exertional Compartment Syndrome (MS-11.3)** for imaging guidelines.

# Physical Child Abuse (PEDMS-2.7)

---

MSP.FX.0002.7.A

v1.0.2025

- See: **Suspected Physical Child Abuse (PEDMS-7)** for imaging guidelines

## References (PEDMS-2)

v1.0.2025

1. Mintz DN, Roberts CC, Bencardino JT, et al. ACR Appropriateness Criteria<sup>®</sup>. Chronic hip pain. Date of origin: 1985. Last review date: 2022. <https://acsearch.acr.org/docs/69425/Narrative>.
2. Bruno MA, Weissman BN, Kransdorf MJ, et al. ACR Appropriateness Criteria<sup>®</sup>. Acute hand and wrist trauma. Date of origin: 1998. Last review date: 2018. <https://acsearch.acr.org/docs/69418/Narrative/>
3. Luchs JS, Flug JA, Weissman BN, et al. ACR Appropriateness Criteria<sup>®</sup>. Chronic ankle pain. Date of origin: 1998. Last review date: 2017. <https://acsearch.acr.org/docs/69422/Narrative>.
4. Taljanovic MS, Chang EY, Ha AS, et al. ACR Appropriateness Criteria<sup>®</sup>. Acute Trauma to the Knee. Last review date: 2019. <https://acsearch.acr.org/docs/69419/Narrative/>.
5. Bencardino JT, Stone TJ, Roberts CC, et al. ACR Appropriateness Criteria<sup>®</sup>. Stress (fatigue/insufficiency) fracture, including sacrum, excluding other vertebrae. Last review date: 2016. <https://acsearch.acr.org/docs/69435/Narrative/>.
6. Rodrigo RM, Vilanova JC, Martel J. Sports injuries in children and adolescents: a case-based approach. New York, NY: Springer; 2014.
7. Wootton-Gorges SL, Soares BP, Alazraki AL, et al. ACR Appropriateness Criteria<sup>®</sup>. Suspected physical abuse—child. Last review date: 2016. <https://acsearch.acr.org/docs/69443/Narrative/>.
8. Christian CW, Crawford-Jakubiak JE, Flaherty EG, et al. AAP Clinical Practice Guideline: The evaluation of suspected physical child abuse. *Pediatrics*. 2015;135(5):e1337-e1354. doi:10.1542/peds.2015-0356 .
9. Nguyen JC, Markhardt BK, Merrow AC, Dwek JR. Imaging of pediatric growth plate disturbances. *RadioGraphics*. 2017;37(6):1791-812.
10. Ecklund K. Sports-related injuries of the pediatric musculoskeleton: lower extremity. 2021. In: Hodler J, Kubik-Huch RA, von Schulthess GK, eds. Musculoskeletal Diseases 2021-2024: Diagnostic Imaging [Internet]. Cham (CH): Springer; 2021. Chapter 19. PMID: 33950618.
11. Kraus R, Dresing K. Rational usage of fracture imaging in children and adolescents. *Diagnostics (Basel)*. 2023;13(3):538. doi:10.3390/diagnostics13030538.
12. Chauvin NA, Khwaja A. Musculoskeletal imaging in neonates: use of ultrasound. *Pediatr Radiol*. 2022;52(4):765-776. doi:10.1007/s00247-021-05152-2.
13. Wang DC, Deeney V, Roach JW, et al. Imaging of physeal bars in children. *Pediatr Radiol*. 2015;45:1403–1412. doi:10.1007/s00247-015-3280-5.
14. Jawetz ST, Shah PH, Potter HG. Imaging of physeal injury: overuse. *Sports Health*. 2015;7(2):142-53. doi:10.1177/1941738114559380.
15. Moritz JD. Sonographic fracture diagnosis in children and adolescents. *Rofo*. 2023;195(9):790-796. doi:10.1055/a-2042-2161.

# Soft Tissue and Bone Masses (PEDMS-3)

Guideline	Page
Soft Tissue and Bone Masses – General Considerations (PEDMS-3.1).....	24
Soft Tissue Mass with Negative X-ray and Abnormal Ultrasound (PEDMS-3.2).....	25
Soft Tissue Mass with Calcification/Ossification on X-ray (PEDMS-3.3).....	26
Mass Involving Bone (Including Suspected Lytic and Blastic Metastatic Disease) (PEDMS-3.4).....	27
References (PEDMS-3).....	28

# Soft Tissue and Bone Masses – General Considerations (PEDMS-3.1)

MSP.ST.0003.1.A

v1.0.2025

- A pertinent clinical 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 or oncologist is strongly recommended to help determine the most helpful advanced imaging studies for an individual.
- 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.
- Ultrasound (CPT<sup>®</sup> 76881 or CPT<sup>®</sup> 76882) if initial plain x-ray<sup>12,13</sup> is negative 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  $\geq 1$  year
  - vascular malformations (see: **Vascular Anomalies (PEDPVD-2)** in the Pediatric Peripheral Vascular Disease 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.
- MRI without and with contrast, or ultrasound (CPT<sup>®</sup> 76881 or CPT<sup>®</sup> 76882) is indicated for lipomas in other locations (not subcutaneous).



## Soft Tissue Mass with Negative X-ray and Abnormal Ultrasound (PEDMS-3.2)

MSP.ST.0003.2.A

v1.0.2025

- MRI without and with contrast is indicated when plain x-ray is negative and ultrasound is abnormal.<sup>13</sup>
  - CT without or with contrast is indicated if MRI is contraindicated.<sup>13</sup>

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

MSP.ST.0003.3.A

v1.0.2025

- MRI without and with contrast is indicated when calcification/ossification is noted on plain x-ray.<sup>13</sup>
  - CT without or with contrast is indicated if MRI is contraindicated.<sup>13</sup>

# Mass Involving Bone (Including Suspected Lytic and Blastic Metastatic Disease) (PEDMS-3.4)

MSP.ST.0003.4.A

v1.0.2025

- Plain x-rays of the entire bone containing the lesion are required prior to consideration of advanced imaging. Many benign bone tumors have a characteristic appearance on plain x-ray and advanced imaging is not necessary unless one of the following applies:
  - MRI without and with contrast and/or CT without may be indicated for preoperative planning.
  - MRI without and with contrast when the diagnosis is uncertain based on plain x-ray appearance.
    - CT without or with contrast can be approved if MRI is contraindicated.
- Surveillance of benign bony lesions is with plain x-ray<sup>11</sup>
  - MRI without and with contrast may be approved for new findings on x-ray, or new or worsening clinical symptoms not explained by recent x-ray.
- Osteochondroma, osteoid osteoma, osteogenic sarcoma, and Ewing sarcoma family of tumors should be imaged according to **Bone Tumors (PEDONC-9)** in the Pediatric Oncology Imaging Guidelines.
- If there is concern for metastatic disease in an individual with a known malignancy, refer to the appropriate Pediatric Oncology Imaging Guideline.

## References (PEDMS-3)

v1.0.2025

1. ACR–SPR–SSR Practice parameter for the performance and interpretation of magnetic resonance imaging (MRI) of bone and soft tissue tumors. Revised 2020 (Resolution 30) <https://www.acr.org/-/media/ACR/Files/Practice-Parameters/MR-SoftTissue-Tumors.pdf?la=en>.
2. Arndt CAS. Soft Tissue Sarcomas. In: Kliegman RM, St. Geme JW III, Blum NJ, et. al., eds. *Nelson Textbook of Pediatrics*. 21<sup>st</sup> edition. Philadelphia, PA: Elsevier; 2020:2685-2688.
3. Arndt CAS. Neoplasms of bone. In: Kliegman RM, St. Geme JW III, Blum NJ, et. al., eds. *Nelson Textbook of Pediatrics*. 21<sup>st</sup> edition. Philadelphia, PA: Elsevier; 2020:2689-2697.
4. Eutsler EP, Siegel MJ. Musculoskeletal system and vascular imaging. In: Siegel MJ, ed. *Pediatric sonography*. 5<sup>th</sup> ed. Philadelphia, PA: Wolters Kluwer; 2018:601-11.
5. Johnson CM, Navarro OM. Clinical and sonographic features of pediatric soft-tissue vascular anomalies part I: classification, sonographic approach and vascular tumors. *Pediatr Radiol*. 2017;47(9):1184-95. doi:10.1007/s00247-017-3885-y.
6. Johnson CM, Navarro OM. Clinical and sonographic features of pediatric soft-tissue vascular anomalies part 2: vascular malformations. *Pediatr Radiol*. 2017;47(9):1196-1208. doi:10.1007/s00247-017-3906-x.
7. Morrison WB, Weissman BN, Kransdorf MJ, et al. *ACR Appropriateness Criteria*<sup>®</sup>. Primary bone tumors. Date of origin: 1995. Last review date: 2019. <https://acsearch.acr.org/docs/69421/Narrative/>.
8. Mintz DN, Roberts CC, Bencardino JT, et al. *ACR Appropriateness Criteria*<sup>®</sup>. Chronic hip pain. Last review 2022. <https://acsearch.acr.org/docs/69425/Narrative/>.
9. Sargar KM, Sheybani EF, Shenoy A, Aranake-Chrisinger J, Khanna G. Pediatric fibroblastic and myofibroblastic tumors: a pictorial review. *RadioGraphics*. 2016;36:1195-1214. doi:10.1148/rg.2016150191.
10. Sheybani EF, Eutsler EP, Navarro OM. Fat-containing soft-tissue masses in children. *Pediatr radiol*. 2016;46(13):1760-73. doi:10.1007/s00247-016-3690-z.
11. Collier CD, Nelson GB, Conry KT, Kosmas C, Getty PJ, Liu RW. The natural history of benign bone tumors of the extremities in asymptomatic children: A longitudinal radiographic study. *J Bone Joint Surg Am*. 2021;103(7):575-580. doi:10.2106/JBJS.20.00999. PMID: 33646982.
12. Acord, MR, Pace, E, El-Ali, A, et al. Imaging of pediatric extremity soft tissue tumors: A COG Diagnostic Imaging Committee/SPR Oncology Committee White Paper. *Pediatr Blood Cancer*. 2023;70(Suppl. 4):e29944. <https://doi.org/10.1002/pbc.29944>.
13. Garner H, Wessell DF, Lenchik L, et al. ACR Appropriateness Criteria Soft Tissue Masses; Revised 2022 <https://acsearch.acr.org/docs/69434/Narrative/>.

# Limping Child (PEDMS-4)

Guideline	Page
General Evaluation of the Limping Child (PEDMS-4.1).....	30
Limping Child with Suspected Trauma (PEDMS-4.2).....	31
Limping Child with Suspected Infection (PEDMS-4.3).....	32
Limping Child with No Evidence of Trauma or Infection (PEDMS-4.4).....	33
References (PEDMS-4).....	34

# General Evaluation of the Limping Child (PEDMS-4.1)

---

MSP.LC.0004.1.A

v1.0.2025

- 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 pertinent clinical 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.
- X-ray should be obtained if there are no localized findings on physical examination.<sup>5</sup>

# Limping Child with Suspected Trauma (PEDMS-4.2)

MSP.LC.0004.2.C

v1.0.2025

- Plain x-rays 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 x-rays, and if a fracture is demonstrated, additional imaging may not be required.
- If initial x-rays are negative, but limping symptoms or avoidance of weight-bearing persist, follow-up x-rays in 7 to 10 days are indicated.
  - If plain films are negative and suspicion remains high for stress fractures or soft tissue injury:
    - MRI without contrast of the affected body area
- CT use is limited in the evaluation of the limping child with suspected trauma.

# Limping Child with Suspected Infection (PEDMS-4.3)

MSP.LC.0004.3.C

v1.0.2025

- Pain localized to hip:
  - It is essential to exclude septic arthritis. Ultrasound of the hip (CPT<sup>®</sup> 76881 or 76882) is used to exclude hip joint effusion.
    - Hip joint fluid aspiration to distinguish infection from non-infectious etiologies if hip joint effusion is demonstrated.
    - Plain x-rays should be obtained if no hip joint effusion is demonstrated.
    - MRI without contrast (CPT<sup>®</sup> 73721) or without and with contrast (CPT<sup>®</sup> 73723) is indicated if plain films are not diagnostic.
- Pain localized distal to hip:
  - MRI without contrast or without and with contrast of the affected body part if plain x-rays are not diagnostic.
- Non-localized pain:
  - Plain x-rays of the spine, pelvis, and lower extremities may be necessary to localize the abnormality.
  - MRI without contrast or without and with contrast of the affected body area is indicated if plain x-ray is not diagnostic and suspicion for infection remains high.



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

MSP.LC.0004.4.A

v1.0.2025

- This differential diagnosis is quite broad.
  - Transient (or toxic) synovitis of the hip:
    - Ultrasound of the hip (CPT<sup>®</sup> 76881 or CPT<sup>®</sup> 76882) is the preferred initial exam.
      - Plain x-rays if no hip effusion is demonstrated.
      - Hip joint fluid aspiration is indicated if a hip joint effusion is demonstrated. This is usually performed with US guidance, though fluoroscopic guidance or blind aspiration may be required.
  - Avascular Necrosis, see: **Avascular Necrosis (AVN)/ Legg-Calvé-Perthes Disease (PEDMS-6)**
  - Juvenile Idiopathic Arthritis, see: **Juvenile Idiopathic Arthritis (PEDMS-10.1)**
  - Histiocytic Disorders, see: **Histiocytic Disorders (PEDONC-18)** in the Pediatric Oncology Imaging Guidelines
  - Neoplasm, see: **General Guidelines (PEDONC-1), Pediatric Leukemias (PEDONC-3), Neuroblastoma (PEDONC-6), Pediatric Soft Tissue Sarcomas (PEDONC-8), or Bone Tumors (PEDONC-9)** in the Pediatric Oncology Imaging Guidelines
  - Child abuse, see: **Suspected Physical Child Abuse (PEDMS-7)**

## References (PEDMS-4)

**v1.0.2025**

1. Sadfar NM, Rigsby CK, Iyer RS, et al. *ACR Appropriateness Criteria*<sup>®</sup>. Limping child—Ages 0-5 Years. Date of origin: 1995. Last review date: 2018. <https://acsearch.acr.org/docs/69361/Narrative/>
2. Herman MJ, Martinek M. The limping child. *Pediatr Rev*. 2015;36(5):184-197. doi:10.1542/pir.36-5-184.
3. Chaturvedi A, Rupasov A. The acutely limping preschool and school-age child: an imaging perspective. *Semin Musculoskelet Radiol*. 2018;22(1):46-56. doi:10.1055/s-0037-1608001.
4. Thapa M, Vo JN, Shiels WE. Ultrasound-guided musculoskeletal procedures in children. *Pediatr Radiol*. 2013;43:55-60. doi:10.1007/s00247-012-2599-4.
5. Karout L, Naffaa L. Pediatric hip disorders: imaging guidelines and recommendations. *Radiol Clin North Am*. 2022;60(1):149-163. doi:10.1016/j.rcl.2021.08.007.

# Developmental Dysplasia of the Hip (PEDMS-5)

Guideline	Page
Developmental Dysplasia of the Hip (PEDMS-5).....	36
References (PEDMS-5).....	38

# Developmental Dysplasia of the Hip (PEDMS-5)

MSP.DZ.0005.C

v1.0.2025

## 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<sup>®</sup> 76885 or CPT<sup>®</sup> 76886) is recommended for infants between 4 weeks<sup>8</sup> of age and 4 months of age<sup>9</sup> 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)
- For children between 4 and 6 months of age plain x-ray is the preferred imaging modality as femoral head ossification is often seen on x-ray in normal individuals<sup>9</sup>
  - If x-ray is inconclusive, ultrasound (CPT<sup>®</sup> 76885 or CPT<sup>®</sup> 76886) may be indicated.
- Indications for follow-up hip ultrasound (CPT<sup>®</sup> 76885 or CPT<sup>®</sup> 76886):
  - Type IIA hip 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 with an alpha angle (bony angle) between 50 to 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 and with contrast (CPT<sup>®</sup> 73723), MRI without contrast (CPT<sup>®</sup> 73721)<sup>9,10</sup>, or CT without contrast (CPT<sup>®</sup> 73700) 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.

- Hip ultrasound is NOT indicated for the following:
  - Infants less than 4 weeks of age, since 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.

### **Background and Supporting Information**

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 reducible subluxation to irreducible subluxation or dislocation of the femoral head. 60 to 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.

## References (PEDMS-5)

**v1.0.2025**

1. Nguyen JC, Dorfman SR, Rigsby CK, et al. ACR appropriateness criteria: Developmental dysplasia of the hip—child. 2018, American College of Radiology. Reston, VA. [http://www.jacr.org/article/S1546-1440\(09\)00189-6/fulltext](http://www.jacr.org/article/S1546-1440(09)00189-6/fulltext).
2. Mulpuri K, Song KM, Gross RH, et al. The American Academy of Orthopaedic Surgeons Evidence-Based Guideline on detection and nonoperative management of pediatric developmental dysplasia of the hip in infants up to six months of age. *J Bone Joint Surg Am.* 2015;97(20):1717-1718. doi:10.2106/JBJS.O.00500.
3. Sankar WN, Horn BD, Winell JJ, Wells L. Developmental dysplasia of the hip. In: Kliegman RM, St. Geme JW III, Blum NJ, et al., eds. *Nelson Textbook of Pediatrics.* 21<sup>st</sup> edition. Philadelphia, PA: Elsevier; 2020:3623-3628.
4. Chin MS, Betz BW, Halanski MA. Comparison of hip reduction using magnetic resonance imaging or computed tomography in hip dysplasia. *J Pediatr Orthop.* 2011;31(5):525-529. doi:10.1097/BPO.0b013e31821f905b.
5. Shaw BA, Segal LS. Evaluation and referral for developmental dysplasia of the hip in infants. *Pediatrics.* 2016;138(6):e20163107. doi:10.1542/peds.2016-3107.
6. Wright J, James K. Developmental dysplasia of the hip. In: Aresti NA, Ramachandran M, Paterson M, Barry M, eds. *Paediatric Orthopedics in Clinical Practice.* London: Springer; 2016:69-90.
7. Ortiz-Neira CL, Paolucci EO, Donnon T. A meta-analysis of common risk factors associated with the diagnosis of developmental dysplasia of the hip in newborns. *Euro J Radiol.* 2012;8:e344-e351. doi:10.1016/j.ejrad.2011.11.003.
8. Karout L, Naffaa L. Pediatric hip disorders: imaging guidelines and recommendations. *Radiol Clin North Am.* 2022;60(1):149-163. doi:10.1016/j.rcl.2021.08.007.
9. Barrera CA, Cohen SA, Sankar WN, Ho-Fung VM, Sze RW, Nguyen JC. Imaging of developmental dysplasia of the hip: ultrasound, radiography and magnetic resonance imaging. *Pediatr Radiol.* 2019;49(12):1652-1668. doi:10.1007/s00247-019-04504-3.
10. Rosenbaum DG, Servaes S, Bogner EA, Jaramillo D, Mintz DN. MR Imaging in postreduction assessment of developmental dysplasia of the hip: goals and obstacles. *RadioGraphics.* 2016;36(3):840-854.

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

Guideline	Page
Avascular Necrosis and Legg-Calvé-Perthes Disease (PEDMS-6.1).....	40
Osteonecrosis (PEDMS-6.2).....	41
References (PEDMS-6).....	42

# Avascular Necrosis and Legg-Calvé-Perthes Disease (PEDMS-6.1)

MSP.AN.0006.1.C

v1.0.2025

- Plain x-ray is the initial imaging study and may be all that is necessary for follow-up<sup>9</sup>.
- MRI Hip either without contrast (CPT<sup>®</sup> 73721) or without and with contrast (CPT<sup>®</sup> 73723) is indicated if the diagnosis is uncertain on plain x-ray,<sup>8</sup> or for preoperative planning.<sup>12</sup>
  - If MRI is contraindicated or unavailable, the following study may be approved in lieu of MRI:
    - CT scan without contrast



## Osteonecrosis (PEDMS-6.2)

MSP.AN.0006.2.A

v1.0.2025

- Osteonecrosis can occur in a number of conditions, including during treatment for developmental dysplasia of the hip.
- Individuals 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: **Acute Lymphoblastic Leukemia (ALL) (PEDONC-3.2)** in the Pediatric Oncology Imaging Guidelines.
- Known or suspected osteonecrosis in long-term cancer survivors should be imaged according to guidelines in: **Osteonecrosis in Long Term Cancer Survivors (PEDONC-19.4)** in the Pediatric Oncology Imaging Guidelines.
- X-ray is indicated as initial imaging study<sup>9,12</sup>
- MRI either without contrast or without and with contrast in other individuals with concern for osteonecrosis and negative or inconclusive recent x-ray, if imaging results will change current individual management. Early phase of osteonecrosis may be seen on MR with normal x-ray findings.<sup>11</sup>
  - CT scan without contrast may be appropriate for surgical planning<sup>6</sup>

## References (PEDMS-6)

v1.0.2025

1. Boutault JR, Baunin C, Bérard E, et al. Diffusion MRI of the neck of the femur in Legg-Calvé-Perthes disease: a preliminary study. *Diagn Interv Imaging*. 2013; 94(1):78-83. doi:10.1016/j.diii.2012.10.003.
2. Divi SN, Bielski RJ. Legg-Calvé-Perthes Disease. *Pediatric annals*. 2016 Apr 14;45(4):e144-9.
3. Hindorf C, Glatting G, Chiesa C, et al. EANM Dosimetry Committee guidelines for bone marrow and whole body dosimetry. *Eur J Nucl Med Mol Imaging*. 2010;37(6):1238-1250. doi:10.1007/s00259-010-1422-4.
4. Kaste SC, Karimova EJ, Neel MD. Osteonecrosis in children after therapy for malignancy. *AJR Am J Roentgenol*. 2011;196(5):1011-18. doi:10.2214/AJR.10.6073.
5. Laine J, Martin BD, Novotny SA, et al. Role of advanced imaging in the diagnosis and management of active Legg-Calvé-Perthes Disease. *J Am Acad Orthop Surg*. 2018;26:526-36. doi:10.5435/JAAOS-D-16-00856.
6. Murphey MD, Foreman KL, Klassen-Fischer MK, Fox MG, Chung EM, Kransdorf MJ. From the radiologic pathology archives imaging of osteonecrosis: radiologic-pathologic correlation. *Radiographics*. 2014;34:1003-1028. doi:10.1148/rg.344140019.
7. Sankar WN, Winell JJ, Horn DB, Wells L. Legg-Calve-Perthes Disease. In: Kliegman RM, St. Geme JW III, Blum NJ, et al., eds. *Nelson Textbook of Pediatrics*. 21<sup>st</sup> edition. Philadelphia, PA: Elsevier; 2020:3628-3631.
8. Ha AS, Chang EY, Bartolotta RJ, et al. ACR Appropriateness Criteria® Osteonecrosis: 2022 Update. *J Am Coll Radiol*. 2022;19(11S):S409-S416. doi: 10.1016/j.jacr.2022.09.009.
9. Divi SN, Bielski RJ. Legg-Calvé-Perthes Disease. *Pediatr Ann*. 2016;45(4):e144-9. doi:10.3928/00904481-20160310-03.
10. Jones, LC, Kaste, SC, Karol, SE, et al. Team approach: Management of osteonecrosis in children with acute lymphoblastic leukemia. *Pediatr Blood Cancer*. 2020;67:e28509. doi:10.1002/pbc.28509.
11. Chan, S, Coblentz, A, Bhatia, A, et al. Imaging of pediatric hematopoietic stem cell transplant recipients: A COG Diagnostic Imaging Committee/SPR Oncology Committee White Paper. *Pediatr Blood Cancer*. 2023;70(Suppl. 4):e30013. doi:10.1002/pbc.30013.
12. Ng T, Liu R, Kulkarni VA. Legg-Calvé-Perthes disease: Diagnosis, decision making, and outcome. *Current Sports Medicine Reports*. 2024;23(2):45-52.

# Suspected Physical Child Abuse (PEDMS-7)

Guideline	Page
Suspected Physical Child Abuse (PEDMS-7).....	44
References (PEDMS-7).....	46

# Suspected Physical Child Abuse (PEDMS-7)

MSP.AB.0007.C

v1.0.2025

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.

## **Skeletal Injury**

- The x-ray 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 x-ray evaluation based on history and physical examination may be preferable to skeletal survey.
- Suspected injury to the spine should usually first be evaluated with plain x-rays. 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 without contrast and/or MRI without contrast or without and with contrast of suspected sites should be approved.
- CT Chest without contrast (CPT<sup>®</sup> 71250) is indicated in patients with a negative skeletal survey and a high clinical suspicion for rib fracture associated with child abuse.<sup>8</sup>
- A repeat skeletal survey performed approximately 2 weeks after the initial examination can provide additional information on the presence and age of child abuse fractures and should be performed when abnormal or equivocal findings are found on the initial study and when abuse is suspected on clinical grounds

## **Head Injury**

- CT Head without contrast (CPT<sup>®</sup> 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.<sup>7</sup>
  - CT Head without contrast (CPT<sup>®</sup> 70450) is also indicated when known or suspected cervical trauma is present in a pediatric individual.
  - CT Head without contrast (CPT<sup>®</sup> 70450) is indicated in individuals less than 1 year of age, even if no neurologic symptoms are detected due to the great potential morbidity of abusive head trauma. MRI Brain without contrast (CPT<sup>®</sup> 70551) may also be approved.<sup>1</sup>
  - CT Cervical Spine without contrast (CPT<sup>®</sup> 72125) and/or MRI Cervical Spine without contrast (CPT<sup>®</sup> 72141) or without and with contrast (CPT<sup>®</sup> 72156) may be

approved when there is clinical evidence of head injury or when skull fracture of any age is detected on survey skull x-ray. CT Spine (CPT<sup>®</sup> 72125, CPT<sup>®</sup> 72128, CPT<sup>®</sup> 72131) may be approved if MRI is not readily available.<sup>9</sup>

- MRI Brain without contrast (CPT<sup>®</sup> 70551) or without and with contrast (CPT<sup>®</sup> 70553) is indicated to evaluate brain parenchymal injury, or in a child where the clinical signs of brain injury are not sufficiently explained by CT findings.

### **Other Body Area Injuries**

- CT should be performed with contrast unless an absolute contraindication exists.
- ANY of the following imaging studies are indicated for suspected injury to the abdomen or pelvis:<sup>6,7</sup>
  - Abdominal ultrasound (CPT<sup>®</sup> 76700)
  - Pelvic ultrasound (CPT<sup>®</sup> 76856)
  - CT Abdomen with contrast (CPT<sup>®</sup> 74160)
  - CT Pelvis with contrast (CPT<sup>®</sup> 72193)
  - CT Abdomen and Pelvis with contrast (CPT<sup>®</sup> 74177)
- ANY of the following imaging studies are indicated for suspected injury to the chest:
  - CT Chest without contrast (CPT<sup>®</sup> 71250)
  - CT Chest with contrast (CPT<sup>®</sup> 71260)

### **Screening of other children**

- Contacts are defined as the asymptomatic siblings, cohabiting children, or children under the same care as an index child with suspected child physical abuse. All contact children should undergo a thorough physical examination and a history elicited prior to imaging. Contact children younger than 12 months should have neuroimaging, and skeletal survey. CT Head without contrast (CPT<sup>®</sup> 70450) or MRI Brain without contrast (CPT<sup>®</sup> 70551) may be approved. Contact children aged 12 to 24 months should undergo skeletal survey. No routine imaging is indicated in asymptomatic children older than 24 months.<sup>10</sup>

### **Background and Supporting Information**

Child abuse injuries may affect any organ or system. Fractures are common, but injuries may also involve solid and hollow visceral organs, and/or superficial and deep soft tissue injuries. 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.

## References (PEDMS-7)

**v1.0.2025**

1. Wooten-Gorges SL, Soares BP, Alazarki AL, et al. *ACR Appropriateness Criteria*<sup>®</sup>. Suspected Physical Abuse—Child. Date of origin: 1984. Last review: 2016.
2. Campbell KA, Olson LM, and Keenan HT. Critical elements in the medical evaluation of suspected physical child abuse. *Pediatrics*. 2015;136(1):35-43. doi:10.1542/peds.2014-4192.
3. Christian CW, Crawford-Jakubiak JE, Flaherty EG et al. AAP Clinical Practice Guideline: the evaluation of suspected physical child abuse. *Pediatrics*. 2015;135(5):e1337-e1354. doi:10.1542/peds.2015-0356.
4. Henry MK, Wood JN. Advanced cervical spine imaging in abusive head trauma: an update on recent literature and future directions. *Acad pediatr*. 2018;18(7):733-735. doi:10.1016/j.acap.2018/05.008.
5. Society and College of Radiographers and The Royal College of Radiologists. *The radiological investigation of suspected physical abuse in children*. Revised 1<sup>st</sup> edition. London: The Royal College of Radiologists; 2018. [https://www.rcr.ac.uk/system/files/publication/field\\_publication\\_files/bfcr174\\_suspected\\_physical\\_abuse.pdf](https://www.rcr.ac.uk/system/files/publication/field_publication_files/bfcr174_suspected_physical_abuse.pdf).
6. Henry MK, Bennett CE, Wood JN, Servaes S. Evaluation of the abdomen in the setting of suspected child abuse. *Pediatric radiology*. 2021;23:1-7.
7. Bennett CE, Christian CW. Clinical evaluation and management of children with suspected physical abuse. *Pediatric radiology*. 2021;51(6):853-60.
8. Karmazyn B, Marine MB, Wanner MR, et. al. Chest CT in the evaluation of child abuse - when is it useful? *Child Abuse Negl*. 2022;133:105823. doi:10.1016/j.chiabu.2022.105823.
9. Karmazyn B, Reher TA, Supakul N, et. al. Whole-spine MRI in children with suspected abusive head trauma. *AJR Am J Roentgenol*. 2022;218(6):1074-1087. doi:10.2214/AJR.21.26674.
10. Mankad K, Sidpra J, Mirsky DM, et. al. International consensus statement on the radiological screening of contact children in the context of suspected child physical abuse. *JAMA Pediatr*. 2023;177(5):526-533. doi:10.1001/jamapediatrics.2022.6184.

# Infection/Osteomyelitis (PEDMS-8)

---

Guideline	Page
Infection/Osteomyelitis (PEDMS-8).....	48
References (PEDMS-8).....	49

# Infection/Osteomyelitis (PEDMS-8)

MSP.OI.0008.C

v1.0.2025

- Infection and osteomyelitis imaging indications in pediatric individuals are similar to those for adult individuals other than the limping child.
  - See: **Infection/Osteomyelitis (MS-9)** in the Musculoskeletal Imaging Guidelines other than in the limping child.
  - See: **Limping Child with Suspected Infection (PEDMS-4.3)** for imaging guidelines when limping is present.
  - See: **Inflammatory Musculoskeletal Disease (PEDMS-10)** for imaging guidelines for chronic recurrent multifocal osteomyelitis (CRMO, which is an autoimmune disease).
- Ultrasound of the involved extremity (CPT<sup>®</sup> 76881 or CPT<sup>®</sup> 76882) is indicated to evaluate for effusion or soft tissue fluid collection<sup>6</sup>
  - Ultrasound is not a prerequisite for other advanced imaging studies



## References (PEDMS-8)

**v1.0.2025**

1. Tuson CE, Hoffman EB, and Mann MD. Isotope bone scanning for acute osteomyelitis and septic arthritis in children. *J Bone Joint Surg.* 1994;76(2):306-310.
2. Robinette E, Shah SS. Osteomyelitis. In: Kliegman RM, St. Geme JW III, Blum NJ, et. al., eds. *Nelson Textbook of Pediatrics*, Chapter 684. eds Kliegman RM, Stanton BF, St. Geme JW III, et al. 21<sup>st</sup> edition. Philadelphia, PA: Elsevier; 2020:3670-3676.
3. Funk SS, Copley LA. Acute hematogenous osteomyelitis in children: pathogenesis, diagnosis, and treatment. *Orthopedic Clinics.* 2017;48(2):199-208. doi:10.1016/j.ocl.2016.12.007.
4. Palestro CJ. Radionuclide imaging of osteomyelitis. *Semin Nucl Med.* 2015;45(1):32-46. doi:10.1053/j.semnuclmed.2014.07.005.
5. Shet NS, Iyer RS, et. al. *ACR Appropriateness Criteria*®. Osteomyelitis or Septic Arthritis-Child (Excluding Axial Skeleton). Date of origin: 2021. <https://acsearch.acr.org/docs/3158175/Narrative/>
6. Jaramillo D, Dormans, JP Delgado J, Laor T, St Geme III JW. Hematogenous osteomyelitis in infants and children: Imaging of a changing disease. *Radiology.* 2017;283(3):629-643.

# Foreign Body (PEDMS-9)

Guideline	Page
Foreign Body (PEDMS-9).....	51
Reference (PEDMS-9).....	52

# Foreign Body (PEDMS-9)

MSP.FB.0009.C

v1.0.2025

- Ultrasound (CPT<sup>®</sup> 76881 or CPT<sup>®</sup> 76882) to identify foreign body
- See: **Foreign Body – General (MS-6.1)** in the musculoskeletal Imaging Guidelines for additional imaging guidelines.

## Background and Supporting Information

The common soft tissue foreign bodies in children are wood, glass, and metal slivers. The latter two elements are radiopaque and visible to some degree on plain x-rays, whereas wood is usually radiolucent and nearly always imperceptible on x-rays.

## Reference (PEDMS-9)

v1.0.2025

1. Nung RCH, Lee AWH. Ultrasonographic findings of suspected retained foreign body in soft tissue following penetrating injury. *Hong Kong J Radiol*. 2017;20:76-83. doi:10.12809/hkjr1715382.

# Inflammatory Musculoskeletal Disease (PEDMS-10)

Guideline	Page
Inflammatory Musculoskeletal Disease (PEDMS-10.0).....	54
Juvenile Idiopathic Arthritis (PEDMS-10.1).....	55
Chronic Recurrent Multifocal Osteomyelitis (PEDMS-10.2).....	56
Inflammatory Muscle Diseases (PEDMS-10.3).....	57
References (PEDMS-10).....	58

# Inflammatory Musculoskeletal Disease (PEDMS-10.0)

MSP.MD.0010.0.A

v1.0.2025

- A pertinent clinical evaluation including a detailed history, physical examination, and plain x-rays should be performed prior to considering advanced imaging.
- Inflammatory arthritis imaging indications in pediatric patients are very similar to those for adult individuals. See: **Rheumatoid Arthritis (RA) and Inflammatory Arthritis (MS-15)** in the Musculoskeletal Imaging Guidelines. Specific pediatric considerations are included below.

# Juvenile Idiopathic Arthritis (PEDMS-10.1)

MSP.MD.0010.1.C

v1.0.2025

- Ultrasound (CPT<sup>®</sup> 76881 or 76882) is indicated for assessment of: size and characteristics of joint effusions, extent of synovial hypertrophy, which is the hallmark of juvenile idiopathic arthritis, and involvement of tendinous structures.
  - Repeat imaging for monitoring treatment or with planned treatment change may be approved
  - MRI of the most symptomatic joint without contrast or without and with contrast may be considered if ultrasound is inconclusive and MRI findings would alter individual management
- MRI TMJ (CPT<sup>®</sup> 70336) is indicated annually for detecting silent TMJ arthritis in children with juvenile idiopathic arthritis (JIA).
- MRI without or without and with of the most involved joint may be approved to evaluate involved or symptomatic joints in the following situations:<sup>15</sup>
  - When diagnosis is uncertain prior to initiation of drug therapy
  - To study the effects of treatment with disease modifying anti-rheumatic drug (DMARD) therapy
  - To determine a change in treatment
- MRI (with the exception of the annual screening MRI of the TMJ discussed above) should NOT be considered for routine follow-up of treatment.

# Chronic Recurrent Multifocal Osteomyelitis (PEDMS-10.2)

MSP.MD.0010.2.C

v1.0.2025

- Individuals with Chronic Recurrent Multifocal Osteomyelitis (CRMO) can have the following imaging for evaluation of new or worsening pain, or response to treatment in individuals without complete clinical resolution of pain symptoms, when plain x-rays are non-diagnostic:
  - MRI without contrast of specific painful body areas when plain x-ray and bone scan are insufficient to direct acute individual care decisions.
- Whole body MRI (CPT<sup>®</sup> 76498) can be approved for CRMO in the following situations.
  - WBMRI may be approved in an individual suspected of having CRMO if characteristic MR findings of CRMO would preclude the need for a biopsy.
    - Characteristic finding include multiple lesions most commonly involving the juxtaphyseal/peri-physeal portions of the tibia and femur, the clavicle and thoracolumbar spine.
  - WBMRI may be approved every 6-12 months in individuals with an established diagnosis of CRMO to monitor treatment or to evaluate for clinically occult, but radiographically active lesions.
  - See: **Whole Body MR Imaging (Preface-5.2)** for additional details.

## Background and Supporting Information

- 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).
- Literature suggests MRI may have greater sensitivity for clinically occult lesions than bone scan.



# Inflammatory Muscle Diseases (PEDMS-10.3)

MSP.MD.0010.3.C

v1.0.2025

- A pertinent clinical evaluation including a detailed history, physical examination, and plain x-rays should be performed prior to considering advanced imaging.

## **Inflammatory Muscle Diseases:**

These include but are not limited to 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
- Clinical concern for progression
- 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<sup>®</sup> 73700) is indicated to follow progressive calcification in muscles, but MRI (CPT<sup>®</sup> 73718) is often used instead since it permits assessment of the primary muscle disease as well.
  - Both CT and MRI are rarely indicated concurrently.
- Contrary to adult dermatomyositis, juvenile dermatomyositis is very rarely paraneoplastic in nature, and routine screening for occult neoplasm is not indicated.
  - CT Chest (CPT<sup>®</sup> 71260) and Abdomen and Pelvis (CPT<sup>®</sup> 74177) with contrast are indicated for individuals with palpable lymphadenopathy or hepatosplenomegaly.

## References (PEDMS-10)

v1.0.2025

1. Chauvin NA, Doria AS. Ultrasound imaging of synovial inflammation in juvenile idiopathic arthritis *Pediatr Radiol*. 2017;47(9):1160-1170. doi:10.1007/s00247-017-3934-6.
2. Voit AM, Arnoldi AP, Douis H, et al. Whole-body magnetic resonance imaging in chronic recurrent multifocal osteomyelitis: clinical longterm assessment may underestimate activity. *J Rheumatol*. 2015;42:1357-1537. doi:10.3899/jrheum.141026.
3. Restrepo R, Lee EY, Babyn PS. Juvenile idiopathic arthritis current practical imaging assessment with emphasis on magnetic resonance imaging. *Radiol Clin N Am*. 2013;51(4):703-719. doi:10.1016/j.rcl.2013.03.003.
4. Wu EY, Rabinovich CE. Juvenile idiopathic arthritis. In: Kliegman RM, St. Geme JW III, Blum NJ, et. al., eds. *Nelson Textbook of Pediatrics*. 21<sup>st</sup> edition. Philadelphia, PA: Elsevier; 2020:1260-1268.
5. Robinson AB, Reed AM. Juvenile dermatomyositis. In: Kliegman RM, St. Geme JW III, Blum NJ, et. al., eds. *Nelson Textbook of Pediatrics*. 21<sup>st</sup> edition. Philadelphia, PA: Elsevier; 2020:1280-1284.
6. Ackigoz G, Averill LW. Chronic recurrent multifocal osteomyelitis: typical patterns of bone involvement in whole-body bone scintigraphy. *Nucl Med Commun*. 2014;35(8):797-807. doi:10.1097/MNM.000000000000126.
7. Stern SM, Ferguson PJ. Autoinflammatory Bone Diseases. *Rheum Dis Clin N Am*. 2013;39(4):735-749. doi:10.1016/j.rdc.2013.05.002.
8. Hedrich CM, Hofmann SR, Pablik J, et al. Autoinflammatory bone disorders with special focus on chronic recurrent multifocal osteomyelitis. *Pediatr Rheumatol Online J*. 2013;11:47. doi:10.1186/1546-0096-11-47.
9. Borzutzky A, Stern S, Reiff A et al. Pediatric chronic nonbacterial osteomyelitis. *Pediatrics*. 2012;130(5):e1190-e1197 doi: 10.1542/peds.2011-3788.
10. Khanna G, Sato TSP, Ferguson P. Imaging of chronic recurrent multifocal osteomyelitis. *RadioGraphics*, 2009;29(4):1159-1177. doi:10.1148/rg.294085244.
11. Feldman BM, Rider LG, Reed AM, et al. Juvenile dermatomyositis and other idiopathic inflammatory myopathies of childhood. *The Lancet*. 2008;371(9631):2201-12. doi:10.1016/S0140-6736(08)60955-1.
12. Morris P, Dare J. Juvenile dermatomyositis as a paraneoplastic phenomenon: an update. *J Pediatr Hematol Oncol*. 2010;32(3):189-191. doi:10.1097/MPH.0b013e3181bf29a2.
13. Colebatch-Bourn AN, Edwards CJ, Collado P, et. al. EULAR-PRReS points to consider for the use of imaging in the diagnosis and management of juvenile idiopathic arthritis in clinical practice. *Annals of the rheumatic diseases*. 2015;74(11):1946-1957. doi:10.1136/annrheumdis-2015-207892.
14. Nico MAC, Araújo FF, Guimarães JB, et. al. Chronic nonbacterial osteomyelitis: the role of whole-body MRI. *Insights Imaging*. 2022;13(1):149. doi: 10.1186/s13244-022-01288-3.
15. Sudol-Szopińska I, Herregods N, Doria AS, et. al. Advances in musculoskeletal imaging in juvenile idiopathic arthritis. *Biomedicines*. 2022;10(10):2417. doi:10.3390/biomedicines10102417.
16. Basra HA, Humphries PD. Juvenile idiopathic arthritis: what is the utility of ultrasound? *Br J Radiol*. 2017;90(1073):20160920. doi:10.1259/bjr.20160920.
17. Arnoldi AP, Schlett CL, Douis H, et. al. Whole-body MRI in patients with non-bacterial osteitis: radiological findings and correlation with clinical data. *Eur Radiol*. 2017;27(6):2391-9. doi:10.1007/s00330-016-4586-x.
18. Roderick MR, Sen ES, Ramanan AV. Chronic recurrent multifocal osteomyelitis in children and adults: current understanding and areas for development. *Rheumatology (Oxford)*. 2018;57(1):41-48. doi:10.1093/rheumatology/kex066.
19. Villani M, de Horatio LT, Garganese M, et. al. Whole-body MRI versus bone scintigraphy: which is the best diagnostic tool in patients with chronic recurrent multifocal osteomyelitis (CRMO)? *Pediatr Rheumatol*. 2015;13:P58. doi:10.1186/1546-0096-13-S1-P58.
20. Huber AM. Juvenile idiopathic inflammatory myopathies. *Pediatr Clin North Am*. 2018;65(4):739-56. doi:10.1016/j.pcl.2018.04.006.
21. Zhao Y, Ferguson PJ. Chronic nonbacterial osteomyelitis and chronic recurrent multifocal osteomyelitis in children. *Pediatric Clinics*. 2018;65(4):783-800. doi:10.1016/j.pcl.2018.04.003.
22. Rosendahl K, Maas M. Update on imaging in juvenile idiopathic arthritis. *Pediatr radiol*. 2018;48(6):783-784. doi:10.1007/s00247-017-4039-y.

23. Andronikou S, Kraft JK, Offiah AC, et. al. Whole-body MRI in the diagnosis of paediatric CNO/CRMO. *Rheumatology*. 2020;59(10):2671-80. doi: 10.1093/rheumatology/keaa303.
24. Roderick MR, Shah R, Rogers V, Finn A, Ramanan AV. Chronic recurrent multifocal osteomyelitis (CRMO)–advancing the diagnosis. *Pediatric Rheumatology*. 2016;14(1):1-5. doi:10.1186/s12969-016-0109-1.
25. Malattia C, Tzaribachev N, van den Berg JM, Magni-Manzoni S. Juvenile idiopathic arthritis-the role of imaging from a rheumatologist's perspective. *Pediatric radiology*. 2018;48(6):785-91. doi:10.1007/s00247-017-4014-7.
26. Malattia C, Tolend M, Mazzoni M, et. al. Current status of MR imaging of juvenile idiopathic arthritis. *Best Practice & Research Clinical Rheumatology*. 2020;3:101629. doi:10.1016/j.berh.2020.101629.

# Muscle/Tendon Unit Injuries (PEDMS-11)

Guideline	Page
Muscle/Tendon Unit Injuries (PEDMS-11).....	61

# Muscle/Tendon Unit Injuries (PEDMS-11)

MSP.MI.0011.A

v1.0.2025

- Muscle and tendon unit injury imaging indications in pediatric individuals are identical to those in the general imaging guidelines. See: **Muscle/Tendon Unit Injuries/ Diseases (MS-11)** in the Musculoskeletal Imaging Guidelines.

# Osgood-Schlatter Disease (PEDMS-12)

---

Guideline	Page
Osgood-Schlatter Disease (PEDMS-12).....	63
References (PEDMS-12).....	64

# Osgood-Schlatter Disease (PEDMS-12)

MSP.OD.0012.A

v1.0.2025

- Osgood-Schlatter Disease 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.<sup>4</sup>
- Advanced imaging is not indicated in this disorder.

## Background and Supporting Information

- The condition is self-limited and is secondary to repetitive extensor mechanism stress activities, such as jumping and sprinting.

## References (PEDMS-12)

**v1.0.2025**

1. Alessi S, Depaoli R, Canepari M, et al. Baker's cysts in pediatric patients: ultrasonographic characteristics. *J Ultrasound*. 2012;15:76-81. doi:10.1016/j.jus.2011.06.007.
2. Sarkissian EJ, Lawrence JTR. Osgood-Schlatter Disease and Sinding-Larsen-Johansson Syndrome. In: Kliegman RM, St. Geme JW III, Blum NJ, et. al., eds. *Nelson Textbook of Pediatrics*. 21<sup>st</sup> edition. Philadelphia, PA: Elsevier; 2020:3620-3621.
3. Kaneshiro NK. Osgood-Schlatter disease. Medline Plus. 10/11/2018. <http://www.nlm.nih.gov/medlineplus/ency/article/001258.htm>.
4. Hart E, Meehan WP, Bae DS, d'Hemecourt P, Stracciolini A. The young injured gymnast: A literature review and discussion. *Curr Sports Med Rep*. 2018;17(11):366-375.



# Popliteal (Baker) Cyst (PEDMS-13)

---

Guideline	Page
Popliteal (Baker) Cyst (PEDMS-13).....	66
References (PEDMS-13).....	67

# Popliteal (Baker) Cyst (PEDMS-13)

MSP.PC.0013.C

v1.0.2025

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

## Background and Supporting Information

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.

## References (PEDMS-13)

**v1.0.2025**

1. Lawrence JTR. Popliteal cysts (baker cysts). In: Kliegman RM, St. Geme JW III, Blum NJ, et. al., eds. *Nelson Textbook of Pediatrics*. 21<sup>st</sup> edition. Philadelphia, PA: Elsevier; 2020:3618-3619.
2. Wheeless CR. Baker's cyst/popliteal cysts. Wheeless' Textbook of Orthopaedics. [http://www.wheelessonline.com/ortho/bakers\\_cyst\\_popliteal\\_cysts](http://www.wheelessonline.com/ortho/bakers_cyst_popliteal_cysts).

# Slipped Capital Femoral Epiphysis (SCFE) (PEDMS-14)

---

Guideline	Page
Slipped Capital Femoral Epiphysis (SCFE) (PEDMS-14).....	69
References (PEDMS-14).....	70

# Slipped Capital Femoral Epiphysis (SCFE) (PEDMS-14)

MSP.FE.0014.C

v1.0.2025

- Anteroposterior and lateral x-rays (frog leg or cross table lateral) of both hips will confirm or exclude the diagnosis.<sup>8</sup>
  - If clinical suspicion remains after negative plain films, MRI without contrast (CPT<sup>®</sup> 73721) or without and with contrast (CPT<sup>®</sup> 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.
- MRI without contrast (CPT<sup>®</sup> 73721) is indicated for preoperative planning if MRI was not completed for diagnosis.

## Background and Supporting Information

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).

## References (PEDMS-14)

**v1.0.2025**

1. Sankar WN, Winell JJ, Horn BD, Wells L. Slipped capital femoral epiphysis. In: Kliegman RM, St. Geme JW III, Blum NJ, et. al., eds. *Nelson Textbook of Pediatrics*. 21<sup>st</sup> edition. Philadelphia, PA: Elsevier; 2020:3631-3632.
2. Kim YJ, Sierra RJ. Report of breakout session: slipped capital femoral epiphysis management 2011. *Clin Orthop Relat Res*. 2012;470(12):3464-3466. doi:10.1007/s11999-012-2587-x.
3. Gough-Palmer A, McHugh K. Investigating hip pain in a well child. *BMJ*. 2007;334:1216-1217. doi:10.1136/bmj.39188.515741.47.
4. Hesper T, Zilkens C, Bittersohl B, Krauspe R. Imaging modalities in patients with slipped capital femoral epiphysis. *J Child Orthop*. 2017;11:99-106. doi:10.1302/1863-2548-11-160276.
5. Jarrett DY, Matheney T, Kleinman PK. Imaging SCFE: diagnosis, treatment and complications. 2013. *Pediatr Radiol*. 2013;43:S71-S82. doi:10.1007/s00247-012-2577-x.
6. Peck D. Slipped capital femoral epiphysis: diagnosis and management. *Am Fam Physician*. 2017;95(12):779-84.
7. Sucato DJ. Approach to the Hip for SCFE: the North American perspective. *J Pediatr Orthop*. 2018;38:S5-12. doi:10.1097/BPO.0000000000001183.
8. Karout L, Naffaa L. Pediatric hip disorders: imaging guidelines and recommendations. *Radiol Clin North Am*. 2022;60(1):149-163. doi:10.1016/j.rcl.2021.08.007.

# Limb Length Discrepancy (PEDMS-15)

---

Guideline	Page
Limb Length Discrepancy (PEDMS-15).....	72

# Limb Length Discrepancy (PEDMS-15)

MSP.LL.0015.A

v1.0.2025

- Limb length discrepancy imaging indications in pediatric individuals are identical to those in the general imaging guidelines. See: **Limb Length Discrepancy (MS-17.1)** in the Musculoskeletal Imaging Guidelines.



# Congenital Anomalies of the Foot and Lower Extremity (PEDMS-16)

Guideline	Page
Tarsal Coalition (Calcaneonavicular Bar/Rigid Flat Foot) (PEDMS-16.1).....	74
Club Foot (PEDMS-16.2).....	75
Vertical Talus (PEDMS-16.3).....	76
Femoral Anteversion and Tibial Torsion (PEDMS-16.4).....	77
References (PEDMS-16).....	78

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

MPS.CD.0016.1.A

v1.0.2025

- 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.
- CT without contrast (CPT<sup>®</sup> 73700) or MRI without contrast (CPT<sup>®</sup> 73718) is indicated if tarsal coalition is suspected (because of restricted hindfoot motion on physical exam), and plain x-rays are inconclusive.

# Club Foot (PEDMS-16.2)

MSP.CD.0016.2.C

v1.0.2025

- Plain x-rays should be performed initially since the anomaly is readily visible in older children and adults.
- Ultrasound (CPT<sup>®</sup> 76881 or 76882) can be used to characterize the cartilaginous tarsal bones and demonstrate tarsal bone alignment in infants with non-ossified tarsal bones.
- MRI is not currently used to image clubfoot, and limited experiences are published in the literature. MRI (CPT<sup>®</sup> 73718) or CT (CPT<sup>®</sup> 73700) can be approved to determine residual deficits following repair.
  - Ultrasound is not required prior to MRI or CT if those studies are appropriate.

## Background and Supporting Information

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.

# Vertical Talus (PEDMS-16.3)

MSP.CD.0016.3.C

v1.0.2025

- Plain x-rays should be performed initially since the anomaly is readily visible in older children and adults.
- MRI (CPT<sup>®</sup> 73718) or CT (CPT<sup>®</sup> 73700) to determine residual deficits following repair.

# Femoral Anteversion and Tibial Torsion (PEDMS-16.4)

MSP.CD.0016.4.C

v1.0.2025

- Femoral anteversion is a rotational deformity of the femur, which may lead to an in-toeing gait.
- Tibial torsion is a rotational deformity of the tibia that may lead to in-toeing or out-toeing gait, and can be associated with the foot deformities already discussed in **Tarsal Coalition (Calcaneonavicular Bar/Rigid Flat Foot) (PEDMS-16.1)**, **Club Foot (PEDMS-16.2)**, and **Vertical Talus (PEDMS-16.3)**.
- Both deformities are typically diagnosed on clinical examination, but CT Lower Extremity without contrast (CPT<sup>®</sup> 73700) can be approved for preoperative evaluation<sup>8</sup>.

## Background and Supporting Information

Congenital vertical talus (also known as congenital rocker-bottom foot) is a fixed foot deformity characterized by irreducible talonavicular dislocation. The talus is plantar flexed and does not articulate with the navicular bone.

## References (PEDMS-16)

**v1.0.2025**

1. Miron M-C, Grimard G. Ultrasound evaluation of foot deformities in infants. *Pediatr Radiol*. 2016;46:193-209. doi:10.1007/s00247-015-3460-3.
2. Wise JN, Weissman BN, Appel M, et al. *ACR Appropriateness Criteria*<sup>®</sup>. Chronic foot pain. Date of origin: 1998. Last review date: 2020. <https://acsearch.acr.org/docs/69424/Narrative>.
3. Winell JJ, Davidson RS. Tarsal Coalition. In: Kliegman RM, St. Geme JW III, Blum NJ, et. al., eds. *Nelson Textbook of Pediatrics*. 21<sup>st</sup> edition. Philadelphia, PA: Elsevier; 2020:3601-3602,
4. Denning JR. Tarsal coalition in children. *Pediatric annals*. 2016;45(4):e139-43.
5. Winell JJ, Davidson RS. Talipes equinovarus (clubfoot). In: Kliegman RM, St. Geme JW III, Blum NJ, et. al., eds. *Nelson Textbook of Pediatrics*. 21<sup>st</sup> edition. Philadelphia, PA: Elsevier; 2020:3598-3599.
6. Machida J, Inaba Y, Nakamura N. Management of foot deformity in children. *J Orthop Sci*. 2017;22(2):175-83. doi:10.1016/j.jos.2016.12.009.
7. Hammer MR, Kanaan Y, Strouse PJ. Alignment disorders. In: Coley B, ed. *Caffey's Pediatric Diagnostic Imaging*. 13<sup>th</sup> edition. Philadelphia, PA: Elsevier Saunders; 2019:1296-1308.
8. Waelti S, Fischer T, Griessinger J, et. al. Ultra-low-dose computed tomography for torsion measurements of the lower extremities in children and adolescents. *Insights Imaging*. 2022;13(1):118. doi:10.1186/s13244-022-01257-w.