CIGNA MEDICAL COVERAGE POLICIES - RADIOLOGY

Pediatric Musculoskeletal Imaging Guidelines

Effective Date: February 02, 2027

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.

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General Guidelines (PEDMS-1.0)

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General Guidelines (PEDMS-1.0)

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v1.0.2027

Criteria

- 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 as an initial image, or ultrasound as an initial image in a few clinical instances as specified in the following guideline sections, should be done prior to advanced imaging. The results of initial images performed after the current episode of symptoms started or changed need to be available to the requesting provider of the advanced imaging study.
- 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 be required in specific instances prior to consideration of advanced diagnostic imaging. The criteria for these instances are found within the specific sections of this publication.
- These guidelines are based upon using advanced imaging to answer specific clinical questions that will affect patient management. Imaging is not considered medically necessary if the results will not affect individual management decisions. Standard medical practice would dictate continuing conservative care prior to advanced imaging in individuals who are improving on current treatment programs.

Health Equity Consideration

Health equity is the highest level of health for all individuals; health inequity is the avoidable difference in health status or distribution of health resources due to the social conditions in which individuals are born, grow, live, work, and age. Social determinants of health are the conditions in the environment that affect a wide range of health, functioning, and quality of life outcomes and risks. Examples include the following: safe housing, transportation, and neighborhoods; racism, discrimination, and violence; education, job opportunities, and income; access to nutritious foods and physical activity opportunities; access to clean air and water; and language and literacy skills.

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Age Considerations (PEDMS-1.1)

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Criteria

- Many conditions affecting the musculoskeletal system in the pediatric population have 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 under 19 years of age should be imaged according to the Pediatric Musculoskeletal Imaging Guidelines if discussed. Any conditions not specifically discussed in the Pediatric Musculoskeletal Imaging Guidelines should be imaged according to the General Musculoskeletal Imaging Guidelines. Individuals who are 19 years of age or older should be imaged according to the General Musculoskeletal Imaging Guidelines except where directed otherwise by a specific guideline section(CMS, n.d.).

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Appropriate Clinical Evaluation and Conservative Treatment (PEDMS-1.2)

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- This criteria has moved to: **General Guidelines (PEDMS-1.0)**

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Modality General Considerations (PEDMS-1.3)

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- 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 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.
    - 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.

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        - 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® codes vary by body area and the use of Doppler imaging. These CPT® codes are included in the table at the end 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.

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Evidence Discussion (PEDMS-1)

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Advanced imaging in pediatric populations should be based on child-specific clinical questions, expected impact on management, and whether a lower-risk or more targeted image can sufficiently identify the clinical problem. Pediatric practice parameters emphasize that CT should be performed only when clinically indicated and tailored to the diagnostic task. MRI practice parameters emphasize the use of appropriate protocols, supervision, interpretation, and safety screening. First line imaging, such as x-ray, may be essential in determining which cases may need additional advanced radiology (American College of Radiology, 2019; American College of Radiology, 2022; Hryhorczuk et al., 2016). Radiography remains a conventional first-line image choice when osseous injury, alignment abnormality, or skeletal lesion is the clinical concern; advanced imaging is generally most appropriate when radiographs are nondiagnostic, symptoms persist, complications are suspected, or soft-tissue, marrow, cartilage, vascular, or occult injury assessment is needed (American College of Radiology, 2018; Eutsler & Siegel, 2018; Hryhorczuk et al., 2016). In certain clinical situations, ultrasound can be useful in children because it is dynamic, accessible, does not use ionizing radiation, usually avoids sedation, and can assess superficial soft-tissue masses, joint effusions, tendons, vascularity, and contralateral comparison in real time (Eutsler & Siegel, 2018; Hryhorczuk et al., 2016).

CT may be recommended when rapid, high-resolution, cross-sectional anatomic visualization is needed and the result is expected to change acute management, procedural planning, or diagnosis, particularly when alternative nonionizing modalities are unavailable, nondiagnostic, contraindicated, or too slow for the clinical context (American College of Radiology, 2019). Pediatric CT protocols should be optimized for the smallest radiation dose consistent with diagnostic image quality, using child-size parameters, clinical indication-specific protocols, and avoidance of multiphase or repeated acquisitions unless justified (American College of Radiology, 2019). Radiation dose considerations are central in pediatric CT. Children are more radiosensitive and potentially have longer remaining lifespans during which compounded radiation-associated risk could manifest. It is recommended that repeat CT should be avoided when prior imaging or a lower-dose/nonionizing modality can answer the question (American College of Radiology, 2019; Biassoni & Easty, 2017). It is recommended that contrast-enhanced CT should be reserved for indications where contrast will improve diagnosis, staging, vascular assessment, or treatment planning. In their review, Soares et al point out that while acute adverse reactions and contrast-induced nephropathy are generally less common than in adults there has been recent findings of gadolinium deposition in the brain of those with normal renal function; therefore contrast use in children should be considered carefully (Soares et al., 2017).

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MRI is generally favored when high soft-tissue contrast is needed without ionizing radiation, provided that MRI can be completed safely and in a clinically useful timeframe (American College of Radiology, 2022; Biassoni & Easty, 2017). MRI examinations should be performed and interpreted under an established MRI safety program, with screening for implants/devices, acoustic protection, emergency preparedness, and protocol selection that addresses the clinical question while limiting unnecessary sequences or repeated scans (American College of Radiology, 2022). Sedation or general anesthesia may be required for some young children or individuals with developmental delays to obtain accurate MRI studies. The risks associated with sedation should be weighed against the expected clinical benefit and whether a shorter or non-sedated protocol is feasible (Biassoni & Easty, 2017; Graham, 2017). As with CT imaging, it is recommended that contrast-enhanced MRI should be reserved for indications where contrast will improve the chances for a positive outcome or treatment planning (American College of Radiology, 2022; Fraum et al., 2017; Soares et al., 2017). Risk assessment should include renal function, prior contrast reactions, number and timing of prior contrast administrations, and whether more stable agent can be used (Fraum et al., 2017; Soares et al., 2017; Fotenos, 2018). 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. (Fotenos, 2018; FDA, 2017).

Pediatric nuclear medicine studies should use pediatric-specific protocols, weight- or body-size-adjusted administered activity, and attention to radiation dose optimization; hybrid SPECT/CT or PET/CT should limit CT dose and anatomic coverage to the clinical need (Biassoni & Easty, 2017; Hindorf et al., 2010). Bone scintigraphy with SPECT and low-dose CT may identify mechanical stress or cortical bone pain generators when MRI does not reveal a cause of symptoms, supporting targeted use as a problem-solving test rather than a routine substitute for MRI (Biassoni & Easty, 2017).

Access to CT and MRI can be limited in some hospitals, and MRI may require general anesthesia in children, adding scheduling complexity, risk, and resource needs (Biassoni & Easty, 2017). Advanced imaging inequities may be avoided by allowing alternative pathways when a preferred modality is unavailable, contraindicated, not tolerated, or likely to require sedation delay; transportation, scanner availability, pediatric anesthesia access, and sub-specialty radiology availability can affect real-world care (Biassoni & Easty, 2017; Graham, 2017).

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Fracture and Dislocation (PEDMS-2)

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Fracture and Dislocation (PEDMS-2)

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General Criteria

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

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Acute Fracture (PEDMS-2.1)

MSP.FX.0002.1.C
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Criteria

- 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 considered medically necessary except in complex (comminuted, displaced or intraarticular) joint fractures where MRI or CT without contrast is medically necessary for preoperative planning.
  - 3D Rendering may sometimes be considered medically necessary for complex fracture repairs. See: **3D Rendering (MS-3)** in the Musculoskeletal Imaging Guidelines.
- Ultrasound (CPT® 76881 or CPT® 76882) is considered medically necessary for evaluation of fracture, but is not required to allow for other advanced imaging, especially in infants. 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.
- CT or MRI without contrast is considered medically necessary if plain x-rays are negative or equivocal for fracture, if fracture or bone marrow edema is still clinically suspected, and if the results will determine immediate treatment decisions as documented by the treating physician.

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Joint-Adjacent Fracture (PEDMS-2.2)

MSP.FX.0002.2.A
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Criteria

- CT without contrast is considered medically necessary in complex (comminuted or displaced) fractures seen on plain x-ray involving a joint for preoperative planning.
- CT without contrast is considered medically necessary when there is clinical concern for delayed union or non-union of fracture or joint fusions on follow-up plain x-ray.

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

MSP.FX.0002.3.C
v1.0.2027

Criteria

- 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 seen on plain x-ray, CT without contrast is considered medically necessary.
- MRI without contrast is considered medically necessary 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.
- Compressive injuries of the growth plate (Salter-Harris V) may be difficult to identify on plain films, and MRI without contrast is considered medically necessary for confirmation.

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

MSP.FX.0002.4.C
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Criteria

- If x-rays are negative and an osteochondral fracture is still suspected, or if x-ray and clinical exam suggests an unstable osteochondral injury, either MRI without contrast, MR arthrogram, or CT arthrogram of the involved joint is considered medically necessary.
- If plain x-rays show a non-displaced osteochondral fragment, follow up imaging should be with plain x-rays. Advanced imaging is considered not medically necessary.
- MRI without contrast or CT without contrast is considered medically necessary when healing cannot be adequately assessed on follow up plain x-rays.

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Stress/Occult Fracture (PEDMS-2.5)

MSP.FX.0002.5.C
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Criteria

- These fractures can usually be adequately evaluated by history, physical exam, and x-ray. Advanced imaging may be considered medically necessary 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 5th metatarsal, or scaphoid, and initial plain x-ray fails to establish a definitive diagnosis:
  - MRI or CT without contrast is considered medically necessary, 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 considered medically necessary
- Periodic follow-up plain x-rays will usually show progressive healing.
  - CT without contrast is considered medically necessary when there is clinical concern for non-union.

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Compartment Syndrome (PEDMS-2.6)

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Criteria

- Acute compartment syndrome is a clinical diagnosis made by direct measurement of compartment pressure and is a surgical emergency. Advanced imaging is considered not medically necessary.
- See: Compartment syndrome within the **Compartment Syndrome (MS-11.2)** section of the Musculoskeletal Imaging Guidelines.

Pediatric Musculoskeletal Imaging Guidelines

Evidence Discussion (PEDMS-2)

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Diagnostic imaging plays a critical role in the evaluation and management of pediatric fractures. Initial imaging with plain radiographs remains the standard for suspected fractures and stress reactions in children, as recommended by the American College of Radiology (ACR) (American College of Radiology, n.d.). When radiographs are inconclusive or negative but clinical suspicion persists, advanced imaging modalities such as MRI and CT are considered appropriate next steps. MRI is highly sensitive and specific for detecting stress fractures and physeal injuries, especially when radiographs are inconclusive (Morrison et al., 2024; Jawetz et al., 2022; Chang et al., 2017). 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. CT can be useful in assessing cortical bone detail but it involves exposing an individual to ionizing radiation, which may not be recommended in pediatric populations (Kraus & Dresling, 2023; Talijanovic et al., 2019). Ultrasound has been shown to be effective in detecting fractures in infants and young children, making it an option that avoids exposure to radiation and/or sedation (Moritz, 2023; Chauvin & Khwaja, 2022).

The risks of potential harm or adverse effects on pediatric individuals during imaging should be considered. MRI, while highly sensitive and specific, may require sedation in younger children which introduces anesthesia-related risks (Jawetz et al., 2022; Nguyen et al., 2017). CT and bones scans additionally expose children to ionizing radiation, which could carry long term consequences (Kraus & Dresling, 2023; National Institute for Health and Care Excellence, 2016). Ultrasound is generally safe, non-invasive and radiation free; however, it is operator-dependent and diagnostic accuracy can be variable (Moritz, 2023; Chauvin &Khwaja, 2022).

It has been recommended that special consideration be given to imaging of growth plate and overuse injuries in children. Growth plate injuries require careful imaging assessment due to the potential for long-term growth disturbances. MRI is preferred for detailed evaluation of the growth plate and surrounding structure (Nguyen et al., 2017; Wang et al., 2015). Physeal injuries, often resulting from sports or trauma, are best evaluated initially with radiographs. MRI is the preferred modality for assessing cartilage integrity and subchondral bone involvement, aiding in treatment planning and prognosis (Wang et al., 2015; Jawetz et al., 2015).

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References (PEDMS-2)

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Soft Tissue and Bone Masses (PEDMS-3)

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

MSP.ST.0003.1.A
v1.0.2027

Criteria

- A pertinent clinical evaluation including a detailed history and physical examination should be performed prior to considering advanced imaging.
  - History and physical exam of any palpable soft tissue mass should include documentation of any of the following pertinent clinical features: location, size, and any association with pain.
- 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.
- Ultrasound (CPT® 76881 or CPT® 76882) is considered medically necessary if initial plain x-ray 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 up to, or more than, 1 year
  - vascular malformations (see: **Vascular Anomalies (PEDPVD-2)** in the Pediatric Peripheral Vascular Disease Imaging Guidelines)
- MRI without and with contrast or without contrast is considered medically necessary for any of the following:
  - soft tissue mass greater than 5 cm in diameter
  - soft tissue mass increasing in size
  - painful soft tissue mass
  - deep soft tissue mass or subfascial location
- Advanced imaging is considered not medically necessary for the following entities:
  - ganglion cysts that can be diagnosed by history and physical examination
  - sebaceous cysts as these cysts are benign and additional imaging typically will not change the treatment plan
  - hematomas as these are benign and additional imaging typically will not change the treatment plan
  - subcutaneous lipomas when surgery is not planned
    - MRI without or without and with contrast can be performed if surgery is planned.
- MRI without and with contrast, or ultrasound (CPT® 76881 or CPT® 76882) is considered medically necessary for lipomas in other locations (not subcutaneous).

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

MSP.ST.0003.2.A
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Criteria

- MRI without and with contrast is considered medically necessary when plain x-ray is negative and ultrasound is abnormal.
  - CT without or with contrast is considered medically necessary if MRI is contraindicated.

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

MSP.ST.0003.3.A
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Criteria

- MRI without and with contrast is considered medically necessary when calcification/ ossification is noted on plain x-ray.
  - CT without or with contrast is considered medically necessary if MRI is contraindicated.

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

MSP.ST.0003.4.A
v1.0.2027

Criteria

- 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 considered not medically necessary unless one of the following applies:
  - MRI without and with contrast and/or CT without is medically necessary for preoperative planning.
  - MRI without and with contrast is medically necessary when the diagnosis is uncertain based on plain x-ray appearance.
    - CT without or with contrast is considered medically necessary if MRI is contraindicated.
- Surveillance of benign bony lesions is with plain x-ray
  - MRI without and with contrast is considered medically necessary 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 and Special Populations Oncology Imaging Guidelines.
- If there is concern for metastatic disease in an individual with a known malignancy, refer to the appropriate Pediatric and Special Populations Oncology Imaging Guideline.

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Evidence Discussion (PEDMS-3)

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Diagnostic imaging plays a critical role in evaluating soft and bony tissue masses in pediatric patients. The American College of Radiology (ACR) recommends radiography as the initial imaging modality for suspected soft tissue and bone masses in children, as it provides essential information with minimal radiation exposure (Ahlawat et al., 2024, Garner et al., 2022). 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. Evaluation by a surgical specialist or oncologist is strongly recommended to help determine the most helpful advanced imaging studies for an individual.

For superficial soft tissue masses, ultrasound (US) is highly recommended as an imaging tool. It is non-invasive, free of ionizing radiation, and has demonstrated high sensitivity and specificity in characterizing superficial lesions in pediatric populations (Jacobson et al., 2022; Hung et al., 2020; Sheybani et al., 2016). US can effectively differentiate cystic from solid masses and guide clinical management, including decisions regarding biopsy or surgical intervention. However, MRI may be necessary for preoperative planning or when deeper anatomical involvement is suspected (Arndt et al., 2020; Garner et al., 2022).

When radiographs are inconclusive or when malignancy is suspected, MRI without and with intravenous contrast is considered an appropriate next step. MRI offers superior soft tissue contrast and multiplanar capabilities, which are particularly valuable in pediatric patients due to their smaller anatomical structures and the need to avoid ionizing radiation (Ahlawat et al., 2024; Garner et al., 2022; Sargar et al., 2016; Sheybani et al., 2016). However, MRI may require the use of sedation which could introduce anesthesia-related risks to consider (Garner et al., 2022). CT may be used when MRI is contraindicated, but its use should be judicious given the increased sensitivity of children to radiation (National Cancer Institute, 2002).

Health equity considerations are essential in pediatric imaging. Children from under-served communities may face barriers to accessing advanced imaging modalities (Rochwerger & Mattei, 2018). Evidence supports the use of US and radiography as cost-effective and accessible options that maintain diagnostic accuracy while minimizing risk. Ensuring equitable access to appropriate imaging is critical for timely diagnosis and treatment across diverse pediatric populations.

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Limping Child (PEDMS-4)

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General Evaluation of the Limping Child (PEDMS-4.1)

MSP.LC.0004.1.A
v1.0.2027

Criteria

- This guideline primarily applies to children age 5 and under. It may also be applied to older children with pre-existing conditions who may not be able to communicate, such as a child with significant intellectual disability or other developmental delay. Many of these cases will be urgent, because of the risk of adverse outcomes in a 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.

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Limping Child with Suspected Trauma (PEDMS-4.2)

MSP.LC.0004.2.C
v1.0.2027

Criteria

- 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 considered medically necessary.
  - If plain films are negative and suspicion remains high for stress fractures or soft tissue injury, the following is considered medically necessary:
    - MRI without contrast of the affected body area
- CT use is considered not medically necessary in the evaluation of the limping child with suspected trauma.

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Limping Child with Suspected Infection (PEDMS-4.3)

MSP.LC.0004.3.C
v1.0.2027

Criteria

- Pain localized to hip:
  - It is essential to exclude septic arthritis. Ultrasound of the hip (CPT® 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® 73721) or without and with contrast (CPT® 73723) is considered medically necessary if plain films are not diagnostic.
- Pain localized distal to hip:
  - MRI without contrast or without and with contrast of the affected body part is considered medically necessary if plain x-rays are not diagnostic.
- Non-localized pain:
  - Plain x-rays of the spine, pelvis, and lower extremities may be considered necessary to localize the abnormality.
  - MRI without contrast or without and with contrast of the affected body area is medically necessary if plain x-ray is not diagnostic and suspicion for infection remains high.

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

MSP.LC.0004.4.A
v1.0.2027

Criteria

- Transient (or toxic) synovitis of the hip:
  - Ultrasound of the hip (CPT® 76881 or CPT® 76882) is the medically necessary 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, please use: **Avascular Necrosis (AVN)/ Legg-Calvé-Perthes Disease (PEDMS-6)**
- Juvenile Idiopathic Arthritis, please use: **Juvenile Idiopathic Arthritis (PEDMS-10.1)**
- Histiocytic Disorders, please use: **Histiocytic Disorders (PEDONC-18)** in the Pediatric and Special Populations Oncology Imaging Guidelines
- Neoplasm, please use: **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 and Special Populations Oncology Imaging Guidelines
- Child Abuse, please use: **Suspected Physical Child Abuse (PEDMS-7)**

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Evidence Discussion (PEDMS-4)

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For children age 5 and under, advanced imaging is generally not first-line for an acutely limping child when symptoms are nonlocalized or localized without concern for infection. A detailed clinical history and physical examination, including radiographs, should be performed and may be sufficient to guide initial evaluation. Radiographs are recommended for most children with suspected fracture and may also reveal periosteal reaction, congenital/developmental abnormalities, or neoplasm. Initial radiographs may be negative, but presumptive treatment and/or follow-up radiographs may be appropriate before CT or MRI unless atypical features, severe symptoms, or alternative diagnoses are suspected (Chaturvedi et al., 2018; Herman & Martinek, 2015; Safdar et al., 2018).

CT should be limited because of ionizing radiation and used primarily for detailed characterization of selected osseous abnormalities or occult fractures when radiographs are inadequate (Safdar et al., 2018). MRI may be appropriate as a secondary test when persistent symptoms, findings, or abnormal radiographs suggest marrow disease, neoplasm, osteonecrosis, or occult injury not clearly shown by radiographs. MRI is able to provide imaging of bone marrow, joints, and soft tissues without ionizing radiation (Chaturvedi et al., 2018; Herman & Martinek, 2015; Safdar et al., 2018). Bone scintigraphy may be considered when symptoms are nonlocalized and infection or multifocal osseous disease is suspected, but its use should be selective because it involves ionizing radiation and generally has been displaced by MRI where MRI is available and feasible (Karout & Naffaa, 2022; Safdar et al., 2018).

When there is concern for infection in the limping child, MRI of the lower extremity without or without-and-with IV contrast is usually appropriate as secondary advanced imaging. MRI or 3-phase bone scan may be appropriate when localization is unclear or multifocal disease is suspected (Safdar et al., 2018). MRI supports detection of osteomyelitis, septic arthritis, pyomyositis, abscess, and other soft-tissue or marrow abnormalities. Prompt imaging is important in these instances because septic arthritis and osteomyelitis can deteriorate rapidly and cause long-term sequelae if diagnosis is delayed (Chaturvedi et al., 2018; Herman & Martinek, 2015; Hryhorczuk et al., 2016). CT is usually not appropriate for suspected infection in this clinical setting because MRI better evaluates marrow and soft-tissue infection without ionizing radiation (Safdar et al., 2018; Herman, 2015). Ultrasound is the modality of choice for detecting hip effusion and can guide the decision to aspirate. It may not reliably distinguish transient synovitis from septic arthritis in early disease stages but usually is used to guide fluoroscopic aspiration (Hryhorczuk et al., 2016; Karout & Naffaa, 2022). When hip effusion is present and clinical/laboratory findings suggest septic arthritis, diagnostic aspiration and orthopedic management should not be delayed for additional advanced imaging unless needed to define adjacent osteomyelitis, abscess, or non-hip infection source (Herman

& Martinek, 2015; Hryhorczuk et al., 2016; Safdar et al., 2018). With symptoms localized to a lower extremity site other than the hip/pelvis and concern for infection, MRI of the area of interest without or without-and-with IV contrast is usually appropriate (Safdar et al., 2018).

Imaging decisions should account for safety and feasibility in children, including radiation exposure from CT and bone scan, MRI availability and potential need for sedation in younger children, and whether ultrasound can triage the need for advanced imaging without radiation or sedation (Herman & Martinek, 2015; Hryhorczuk et al., 2016; Safdar et al., 2018).

Pediatric Musculoskeletal Imaging Guidelines

References (PEDMS-4)

v1.0.2027

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Developmental Dysplasia of the Hip (PEDMS-5)

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Developmental Dysplasia of the Hip (PEDMS-5)

MSP.DZ.0005.C
v1.0.2027

Criteria

Screening studies

- Screening ultrasound (CPT® 76885 or CPT® 76886) is medically necessary for infants between 4 weeks of age and 4 months of age with one or more of the following risk factors:
  - breech presentation
  - family history of DDH
  - abnormall 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 by this age.
  - If x-ray is inconclusive, ultrasound (CPT® 76885 or CPT® 76886) is considered medically necessary.

Follow-Up Studies

- Ultrasound is considered medically necessary earlier than 4 weeks of age in individuals with unstable/dislocated hip(s) undergoing abduction brace treatment.
- Follow-up hip ultrasound (CPT® 76885 or CPT® 76886) is considered medically necessary for the following:
  - Graf type IIA hip with an alpha angle (bony angle) between 50 to 59 degrees in a child less than 3 months of age and follow up hip ultrasound is requested to confirm normal development
  - Subluxation or dislocation was diagnosed on previous hip ultrasound using the dynamic Harke imaging method
  - Prior ultrasound demonstrates abnormal hip and treatment has been applied (such as a Pavlik harness or other device), 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 considered medically necessary for clinical suspicion of treatment failure, subluxation or dislocation of the hip.

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- MRI without and with contrast (CPT® 73723), MRI without contrast (CPT® 73721), or CT without contrast (CPT® 73700) is considered medically necessary 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 considered NOT medically necessary for the following:
  - Infants older than 6 months of age as plain x-ray of the hips become more reliable due to femoral head ossification.
  - 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 will have imaging as directed by treating provider.
  - Plain x-ray of the hips should be performed rather than ultrasound if there is a clinical suspicion for teratogenic dysplasia.

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Evidence Discussion (PEDMS-5)

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Imaging plays an important role in the evaluation and assessment of developmental dysplasia of the hip (DDH). In the American College of Radiology Appropriateness Criteria, American Academy of Pediatrics recommendations and the American Academy of Orthopedic Surgeons Guideline, it is recommended that ultrasound (US) is appropriate for initial screening, diagnostic and follow-up of infants between 4 week and 4 months of age with risk factors for DDH (e.g., breech presentation, family history, abnormal exam) or earlier than 4 weeks of age in individuals undergoing abduction brace treatment. Hip laxity is normal after birth and usually resolves spontaneously. The routine use of ultrasound in screening neonates and infants without risk factors for developmental dysplasia of the hip (DDH) is not recommended (Mulpuri et al., 2015; Nguyen et al., 2018; Shaw et al., 2016). US has been demonstrated to have sensitivity and specificity above 90% for detecting hip instability in early infancy and does not introduce any radiation exposure (Barrera et al., 2019; Nguyen et al., 2018; Shaw et al., 2016). Radiographs are recommended as initial imaging after 4-6 months of age, when femoral head ossification is able to be seen, providing improved diagnostic accuracy (Karout & Naffaa, 2022; Nguyen et al., 2018).

MRI has been recommended for use to evaluate hip alignment following reduction. Post-reduction evaluation may require assessment of adjacent soft tissues and MRI would be the best modality for complete visualization (Barrera et al., 2019; Nguyen et al., 2018; Rosenbaum et al., 2016). The use of MRI avoids ionization radiation, but it may require sedation and/or contrast media which could introduce additional risks such as respiratory depression or allergic reaction (Rosenbaum et al., 2016). In situations where MRI is contraindicated or not available, CT has been recommended as an alternative. Its use is often limited to special circumstances, however, due to radiation exposure (Karout & Naffaa, 2022; Nguyen et al., 2018).

Access to advanced imaging may be limited in areas with reduced resources, such as rural and under-served communities. Delays in accessing advanced imaging can disproportionately affect those in these socioeconomic situations. This may lead to a greater reliance on radiographs and ultrasound in those with limited access to avoid delays in diagnosis and appropriate (Karout et al., 2022; Shaw et al., 2016).

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

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

MSP.AN.0006.1.C
v1.0.2027

Criteria

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

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Osteonecrosis (PEDMS-6.2)

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Criteria

- 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 and Special Populations 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 and Special Populations Oncology Imaging Guidelines.
- X-ray is considered medically necessary as initial imaging study.
- MRI either without contrast or without and with contrast is considered medically necessary 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.
  - CT scan without contrast is considered medically necessary for surgical planning.

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Evidence Discussion (PEDMS-6)

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Plain radiography remains the typical first-line imaging modality in children with hip or extremity pain and suspected avascular necrosis because of its broad availability and low cost. Radiographs can help exclude other causes of pain (e.g., fracture, slipped capital femoral epiphysis, tumor). When additional diagnostic investigation is needed, MRI is recommended for early detection of osteonecrosis and similar conditions in children due to superior sensitivity and lack of ionizing radiation (Dillman & Hernandez, 2009; Ha et al., 2022; Laine et al., 2018).

Computed tomography (CT) and nuclear medicine modalities (bone scintigraphy, SPECT) may have a role in diagnosing children when MRI is inconclusive or contraindicated, or when detailed assessment of subchondral bone, articular surface integrity, or collapse is needed. CT provides excellent visualization of the bony architecture and degree of structural compromise but involves ionizing radiation and is less preferred in a pediatric context unless structural detail will change management (Cariello et al., 2024; Ha et al., 2022; Marin et al., 2024). Ultrasound can be useful adjunctively (e.g., effusion detection, hip containment in Legg-Calve-Perthes Disease) but has limited sensitivity and specificity for early ON/AVN (Ng et al., 2024).

MRI is recommended to evaluate suspicion of Legg-Calve-Perthes Disease. Especially during the early stages of clinical evaluation and diagnosis. Early on, radiographs alone may be insufficient to display structural changes around the femoral head and could lead to a delay in diagnosis (NG et al., 2024). MRI has been shown to be most sensitive in visualizing early ischemic changes before radiographic findings are visible (Dillman & Hernandez, 2009; Laine et al., 2018).

MRI screening in pediatric oncology populations has demonstrated detection of subclinical lesions, enabling earlier surveillance and management (Cariello et al., 2024; Kaste et al., 2011). The lack of ionizing radiation is particularly relevant in children who require repeated imaging during growth and long term follow up (Goo, 2015; Kaste et al., 2011; Kuhlen et al., 2017). In children treated for risk factors such as high dose corticosteroids (e.g., in acute lymphoblastic leukemia), malignancy, bone marrow transplantation, or other bone/vascular insults, the literature supports that advanced imaging—particularly MRI—is more sensitive and specific for early ON/AVN prior to collapse of the epiphysis or femoral head (Kaste et al., 2011; Kuhlen et al., 2017).

The risks of exposing pediatric individuals to harm should be a consideration during diagnostic imaging. MRI avoids exposure to ionizing radiation and is recommended over CT and bone scan when at all possible (Goo, 2015; Ha et al., 2022; Marin et al., 2024; Rao et al., 2019). MRI may also allow for earlier detection of osteonecrosis/ avascular necrosis before collapse when compared to CT or bone scan. Earlier detection could allow for improved outcomes including long-term joint preservation and

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reducing the need for surgical intervention (Ng et al., 2024; Rao et al., 2019). It has also been recommended to weigh the benefits versus the risks in the use of sedation and contrast media when selecting an appropriate imaging modality. Complications such as respiratory compromise or allergic reaction could occur (Marin et al., 2024). There may also be inequities in access to appropriate imaging which may require specific consideration. Pediatric ON/AVN disproportionately affects adolescents, children treated in lower-socioeconomic settings, and survivors of childhood cancer; ensuring access to advanced imaging may mitigate disparities in joint salvage outcomes (Basit & Khoshhal, 2022; Ha et al., 2022; Rao et al., 2019).

Pediatric Musculoskeletal Imaging Guidelines

References (PEDMS-6)

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Suspected Physical Child Abuse (PEDMS-7)

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Suspected Physical Child Abuse (PEDMS-7)

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Criteria

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 considered medically necessary, 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 are considered medically necessary.
- CT Chest without contrast (CPT® 71250) is considered medically necessary in individuals with a negative skeletal survey and a high clinical suspicion for rib fracture associated with child abuse.
- 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® 70450) is considered medically necessary 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 considered medically necessary when known or suspected cervical trauma is present in a pediatric individual.
  - CT Head without contrast (CPT® 70450) is considered medically necessary 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® 70551) is also considered medically necessary.

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  - CT Cervical Spine without contrast (CPT® 72125) and/or MRI Cervical Spine without contrast (CPT® 72141) or without and with contrast (CPT® 72156) is medically necessary 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® 72125, CPT® 72128, CPT® 72131) is considered medically necessary if MRI is not readily available.
- MRI Brain without contrast (CPT® 70551) or without and with contrast (CPT® 70553) is considered medically necessary 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 considered medically necessary 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 and Pelvis with contrast (CPT® 74177)
- ANY of the following imaging studies are considered medically necessary for suspected injury to the chest:
  - CT Chest without contrast (CPT® 71250)
  - CT Chest with contrast (CPT® 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® 70450) or MRI Brain without contrast (CPT® 70551) is considered medically necessary. Contact children aged 12 to 24 months should undergo skeletal survey. No routine imaging is considered medically necessary in asymptomatic children older than 24 months.

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Evidence Discussion (PEDMS-7)

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Imaging for the evaluation of suspected physical abuse of a child is critical to both the success of clinical management and for forensic investigation. In children under 2 years of age, radiographic skeletal surveys are typically recommended as the cornerstone for detecting fractures in suspected abuse (Bennett & Christian, 2021; Mankad et al., 2023; Mirsky et al., 2025). Skeletal surveys may still be helpful in older children, but when a more thorough history can be obtained, a tailored radiographic examination may be appropriate. When radiographic examinations are negative but clinical suspicion remains bone scan is recommended as it is useful in detecting subtle fractures (Bennett & Christian, 2021; Mirsky et al., 2025).

Radiographs may not always be sufficient in the examination of suspected physical abuse. MRI has been recommended, especially in suspected spine and head injury, and is preferred over CT in its ability to detect ligamentous and cord injury (Henry & Wood, 2018; Karmazyn, Reher, et al., 2022; Society and College of Radiographers & The Royal College of Radiologists, 2018). CT can be a helpful option to provide improved bony details in assessing head and spine injury or when MRI is contraindicated or unavailable (Karmazyn, Marine, et al., 2022; Mirsky et al., 2025). When acute intracranial injury is suspected or skull fracture is detected on radiograph, CT of the head is recommended as a first-line imaging due to its speed and sensitivity (Henry & Wood, 2018; Karmazyn, Marine et al., 2022; Mirsky et al., 2025). Additionally, MRI of the spine is also recommended in cases of clinical evidence of head injury or detection of skull fracture to add diagnostic value beyond head imaging (Henry & Wood, 2018; Karmazyn, Reher, et al., 2022). CT of the abdomen and pelvis, with contrast, is recommended when there is concern for visceral injury (Henry et al., 2021; Karmazyn, Marine et al., 2022; Mirsky et al., 2025). CT of the chest may also be of use as it can help detect rib fractures and other injury not evident on radiographs (Karmazyn, Marine et al., 2022; Mirsky et al., 2025).

When appropriate, MRI is recommended over CT or bone scan to eliminate risks associated with exposure to radiation. However, MRI may require sedation which presents other risks such as respiratory depression (Henry et al., 2021; Karmazyn, Marine et al., 2022; Karmazyn, Reher, et al., 2022; Mirsky et al., 2025. Acute traumatic cases, or individuals with limited access to imaging types, may be better served by the type of image that can provide a diagnosis in a timely manner to avoid harm due to delays in diagnosis (Henry & Wood, 2018; Mankad et al., 2023; Society and College of Radiographers & The Royal College of Radiologists, 2018).

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Infection/Osteomyelitis (PEDMS-8)

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Infection/Osteomyelitis (PEDMS-8)

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Criteria

- Infection and osteomyelitis imaging indications in pediatric individuals are similar to those for adult individuals other than the limping child.
  - Please use: **Infection/Osteomyelitis (MS-9)** in the Musculoskeletal Imaging Guidelines other than in the limping child.
  - Please use: **Limping Child with Suspected Infection (PEDMS-4.3)** for imaging guidelines when limping is present.
  - Please use: **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® 76881 or CPT® 76882) is considered medically necessary to evaluate for effusion or soft tissue fluid collection[6]
  - Ultrasound is not a prerequisite for other advanced imaging studies

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Evidence Discussion (PEDMS-8)

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In infants and young children, osteomyelitis may involve the epiphysis, transphyseal vessels, growth cartilage, and adjacent joint areas. Young children may present with refusal to bear weight, pseudoparalysis, irritability, or nonspecific systemic symptoms, so imaging should be guided by the suspected anatomic region and by the need to find occult foci or complications. Ultrasound can assess effusion and superficial collections, but whole-region or whole-body imaging may be needed when symptoms are nonspecific or multifocal disease is suspected (Funk & Copley, 2017; Jaramillo et al., 2017; Robinette & Shah, 2020). Ultrasound, bone scintigraphy/SPECT, and labeled leukocyte scintigraphy have selective roles in pediatric osteomyelitis evaluation; they are most useful when clinical localization is uncertain, when rapid bedside assessment for joint or soft-tissue complications is needed, or when MRI is unavailable, contraindicated, nondiagnostic, or impractical (Jaramillo et al., 2017; Lee et al., 2016; Shet et al., 2022).

Ultrasound has no ionizing radiation, is generally well tolerated, and usually does not require sedation, making it a favorable imaging choice for locating effusion, abscess, or superficial subperiosteal collection in children (Lee et al., 2016; Shet et al., 2022). The American College of Radiology pediatric criteria for suspected extremity osteomyelitis or septic arthritis rate ultrasound as usually appropriate initial imaging in children younger than 5 years (Shet et al., 2022). Ultrasound is most useful when symptoms are localized near a joint or superficial bone because it can rapidly detect joint effusion, soft-tissue abscess, periosteal elevation, and subperiosteal fluid collection (Jaramillo et al., 2017; Lee et al., 2016; Shet et al., 2022). Ultrasound can guide diagnostic aspiration or drainage of joint effusion, abscess, or subperiosteal fluid, which is important when microbiologic confirmation or source control is needed (Jaramillo et al., 2017; Shet et al., 2022).

Three-phase bone scintigraphy, with or without SPECT/SPECT-CT, may be medically necessary when osteomyelitis is suspected but symptoms are poorly localized, multifocal disease is a concern, or MRI is unavailable or contraindicated. It is less favored as routine imaging because it involves ionizing radiation and has limited specificity in abnormal bone (Lee et al., 2016; Palestro, 2015; Shet et al., 2022). Bone scintigraphy has high sensitivity for increased osteoblastic activity, making it useful for detecting clinically occult or multifocal sites. However, trauma, fracture, surgery, tumor, or other inflammatory bone conditions may decrease specificity (Lee et al., 2016; Palestro, 2015). SPECT improves lesion localization compared with scintigraphy and can increase diagnostic confidence when planar findings are equivocal. Hybrid SPECT/CT adds anatomic information but introduces additional CT-related radiation and should be used only when the expected benefit justifies exposure (Lee et al., 2016; Palestro, 2015). Labeled leukocyte scintigraphy may be medically necessary for complicated osteomyelitis, postoperative or hardware-associated infection, abnormal underlying

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bone, or equivocal bone scan when MRI is unavailable or nondiagnostic (Palestro, 2015; Shet et al., 2022). However, bone scan and SPECT are generally less preferred due to lower specificity and radiation exposure. The use of nuclear scans is recommended only in very specific clinical situations.

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References (PEDMS-8)

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Foreign Body (PEDMS-9)

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Pediatric Musculoskeletal Imaging Guidelines

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Foreign Body (PEDMS-9)

MSP.FB.0009.C

v1.0.2027

- Foreign body imaging indications in pediatric individuals are similar to those for adult individuals. Please use:**Foreign Body – General (MS-6.1)** for imaging guidelines.

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Inflammatory Musculoskeletal Disease (PEDMS-10)

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Inflammatory Musculoskeletal Disease (PEDMS-10.0)

MSP.MD.0010.0.A
v1.0.2027

Criteria

- 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 individuals are very similar to those for adult individuals. Please use: **Inflammatory Arthritis (MS-12.2)** in the Musculoskeletal Imaging Guidelines.
- Specific pediatric considerations for juvenile idiopathic arthritis, chronic recurrent osteomyelitis and inflammatory muscle diseases are included in the subsections below.

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Juvenile Idiopathic Arthritis (PEDMS-10.1)

MSP.MD.0010.1.C
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Criteria

- Ultrasound (CPT® 76881 or 76882) is considered medically necessary 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 is considered medically necessary for monitoring treatment or with planned treatment change
  - MRI of the most symptomatic joint without contrast or without and with contrast is considered medically necessary if ultrasound is inconclusive and MRI findings would alter individual management
- MRI TMJ (CPT® 70336) is considered medically necessary annually for detecting silent TMJ arthritis in children with juvenile idiopathic arthritis (JIA).
- MRI without or without and with of the most involved joint is considered medically necessary to evaluate involved or symptomatic joints in the following situations:
  - 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) is considered not medically necessary for routine follow-up of treatment.

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Chronic Recurrent Multifocal Osteomyelitis (PEDMS-10.2)

MSP.MD.0010.2.C
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Criteria

- The following imaging is considered medically necessary for individuals with CRMO 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® 76498) is considerd medically necessary for CRMO in the following situations:
  - Individuals 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.
  - 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.

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Inflammatory Muscle Diseases (PEDMS-10.3)

MSP.MD.0010.3.C
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Criteria

- 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 medically necessary in these disorders for the following purposes:

- selection of biopsy site
- clinical concern for progression
- treatment monitoring
- detection of occult malignancy

Juvenile Dermatomyositis:

Contrary to adult dermatomyositis, juvenile dermatomyositis is very rarely paraneoplastic in nature, and routine screening for occult neoplasm is considered not medically necessary.

The following are considered medically necessary for juvenile dermatomyositis:

- MRI without contrast to confirm the diagnosis and thus avoid a biopsy.
- CT without contrast (CPT® 73700) or MRI (CPT® 73718) to follow progressive calcification in muscles
  - Both CT and MRI are rarely indicated concurrently.
- CT Chest (CPT® 71260) and Abdomen and Pelvis (CPT® 74177) with contrast for individuals with palpable lymphadenopathy or hepatosplenomegaly.

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Evidence Discussion (PEDMS-10)

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Imaging plays a critical role in the evaluation and management of pediatric inflammatory musculoskeletal diseases. Initial radiographs, along with a detailed history and physical examination, can help determine what advanced imaging may be needed. Guidelines recommend that imaging strategies be tailored to the clinical scenario to optimize diagnostic accuracy and safety (Chauvin & Doria, 2017; Roderick et al., 2016).

MRI and ultrasound (US) are recommended as first-line advanced imaging for juvenile idiopathic arthritis (JIA). US has been shown to be instrumental in detecting joint effusion and is recommended for the early detection synovial inflammation (Chauvin & Doria, 2017; Quesada-Masachs et al., 2024). MRI, with sensitivity exceeding 90% in JIA, is recommended when US is inconclusive as it can provide comprehensive assessment of joint inflammation, bone marrow edema, and cartilage damage (Malattia et al., 2020; Sudoł-Szopińska et al., 2022). CT and scintigraphy are rarely recommended due to radiation exposure, but may be necessary in limited or atypical cases (Chauvin & Doria, 2017).

Both bone scintigraphy and MRI are recommended for the diagnostic imaging of chronic recurrent multifocal osteomyelitis (CRMO). Scintigraphy can be helpful in the assessment of new or worsening pain and evaluating the response to treatments (Villani et al., 2015). However, it has been shown to have lower sensitivity and specificity compared to MRI (Villani et al., 2015). With sensitivity over 90% for lesion detection, whole-body MRI is recommended as the superior modality for detecting multifocal bone lesions and monitoring disease activity (Andronikou et al., 2020; Arnoldi et al., 2017; Nico et al., 2022; Roderick et al., 2016; Villani et al., 2015. Additionally, MRI avoids ionizing radiation, making it safer for repeated imaging compared to CT or bone scans (Andronikou et al., 2020).

MRI is also the recommended imaging modality to confirm diagnosis for juvenile muscle disease (e.g., dermatomyositis, polymyositis, inclusion body myositis). MRI is more sensitive to deep muscle edema and changes than US and may help to avoid unnecessary biopsy (Sudoł-Szopińska et al., 2022; Quesada-Masachs et al., 2024). CT is not typically recommended for general diagnosis as it has limited use in soft tissue visualization and to avoid radiation exposure (Chauvin & Doria, 2017). However, CT may be helpful in the assessment of muscle calcification or enlargement of abdominopelvic organs and/or lymph nodes.

Special consideration of potential risks to the individual from imaging must be made, especially in cases where monitoring through repeat images over time will be needed (Andronikou et al., 2020). CT and bone scans involve ionizing radiation which can be harmful and should be avoided when possible (Andronikou et al., 2020; Chauvin & Doria, 2017). While MRI does not expose an individual to radiation, younger individuals

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may require sedation for clear images to be obtained which can pose risks such respiratory depression (Malattia et al., 2020; Voit et al., 2015). There are also risks of allergic reactions to IV contrast. Additional consideration should be given to those with limited access to advanced imaging. Rural and limited resource areas may not provide easy access to the most appropriate imaging modality (Rosendahl & Maas, 2018). Alternatives may be recommended to avoid delays in appropriate care.

Pediatric Musculoskeletal Imaging Guidelines

References (PEDMS-10)

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Muscle/Tendon Unit Injuries (PEDMS-11)

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Muscle/Tendon Unit Injuries (PEDMS-11)

MSP.MI.0011.A

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- Muscle and tendon unit injury imaging indications in pediatric individuals are identical to those in the general imaging guidelines. Please use: **Muscle and Tendon Injuries (MS-11.0)** in the Musculoskeletal Imaging Guidelines.

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Osgood-Schlatter Disease (PEDMS-12)

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Osgood-Schlatter Disease (PEDMS-12)

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Criteria

- Diagnosis is by clinical examination and x-ray, and treatment is conservative.
- Advanced imaging is considered not medically necessary for diagnosis of this disorder.

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Evidence Discussion (PEDMS-12)

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Osgood-Schlatter disease is a self-limiting condition that is secondary to repetitive stress of the knee extensor mechanism. It is defined as traction apophysitis of the tibial tubercle in skeletally immature individuals. It is recommended that clinical exam, history and x-rays are sufficient for diagnosis with high accuracy. Advanced imaging adds little diagnostic benefit, unnecessarily increases healthcare costs, and is generally not recommended (Fox et al., 2018; Hart et al., 2018; Kaneshiro, 2018; Sarkissian & Lawrence, 2020).

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Popliteal (Baker) Cyst (PEDMS-13)

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Popliteal (Baker) Cyst (PEDMS-13)

MSP.PC.0013.C
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Criteria

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 76882) is the medically necessary initial imaging study.
- MRI without contrast (CPT® 73721) is considered medically necessary for preoperative planning or if ultrasound is non-diagnostic.

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Evidence Discussion (PEDMS-13)

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Ultrasound is recommended as a first-line imaging modality for Baker's cyst detection. High accuracy has been reported with sensitivity ranging from 94% to 97% and specificity approaching 100% compared with MRI in pediatric and adult populations. Ultrasound offers practical advantages including portability, low cost, rapid acquisition, and absence of ionizing radiation, making it particularly suitable for children. Ultrasound is also well suited for follow-up of known Baker's cysts and for screening in clinical or population settings due to its accessibility and strong diagnostic performance (Fox et al., 2018; Liu et al., 2022).

For children aged 5 years and older presenting with chronic knee pain, the American College of Radiology (ACR) recommends that when initial imaging is non-diagnostic, MRI without contrast is usually appropriate for comprehensive evaluation of intra-articular structures. MRI and ultrasound generally provide concordant information on cyst presence, but MRI adds detail on associated meniscal or cartilage pathology when clinically relevant. Additional details from MRI may be necessary for preoperative planning. Sedation may be necessary for MRI in younger children due to longer acquisition times and the need for stillness, which may involve risk of complications such as respiratory depression (Fox et al., 2018; Liu et al., 2022).

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

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

MSP.FE.0014.C
v1.0.2027

Criteria

- 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 considered medically necessary 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 considered medically necessary to evaluate the contralateral hip if requested, as some surgeons advocate surgical treatment of pre-slip.
- MRI without contrast (CPT® 73721) is considered medically necessary for preoperative planning if MRI was not completed for diagnosis.

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Evidence Discussion (PEDMS-14)

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Slipped Capital Femoral Epiphysis may be considered in children and adolescents, typically 8 to 15 years of age, presenting with limp, hip/groin/thigh pain, or isolated knee pain. Delayed recognition may worsen prognosis through slip progression, deformity, avascular necrosis (AVN), chondrolysis, femoroacetabular impingement, and early degenerative arthritis (Sankar et al., 2020; Peck, 2017; Hesper et al., 2017; De Angelis et al., 2024). X-ray of both hips is recommended as the initial imaging including anteroposterior and lateral frog leg views for clinically stable SCFE, and anteroposterior and lateral cross table views when unstable SCFE is suspected as frog-leg positioning may worsen pain and potentially affect slip severity in acute unstable slips (Peck, 2017; Hesper et al., 2017; Karout & Naffaa, 2022). Bilateral involvement is frequent and contralateral sequential slip may occur within the first 18 months after unilateral presentation (Peck, 2017; Hesper et al., 2017; De Angelis et al., 2024).

MRI is the recommended advanced imaging test when clinical suspicion remains high despite normal or equivocal radiographs because it is more sensitive than conventional radiography in early SCFE and can depict physeal widening, bone marrow edema, joint effusion, and synovitis before overt epiphyseal displacement is visible. MRI evidence of imminent or early SCFE may support urgent stabilization before further slippage; however, MRI should be used selectively so that imaging does not delay treatment when clinical and radiographic findings are already sufficient. MRI avoids ionizing radiation and is preferred for occult early SCFE, marrow edema, synovitis/effusion, vascularity, and cartilage/soft tissue evaluation, but MRI can be limited by cost, availability, longer scan time, motion, and possible need for sedation in younger or developmentally unable children (Hesper et al., 2017; Karout & Naffaa, 2022; De Angelis et al., 2024). MRI may be useful in acute/unstable SCFE to evaluate pre-existing femoral head vascularity or early AVN when results would alter management, but postoperative MRI can be limited by metallic fixation artifact (Hesper et al., 2017; Sucato, 2018). However, sedation/anesthesia for pediatric MRI introduces safety considerations, including reduced ability to breathe independently under general anesthesia and potential need for airway support (Bang et al., 2024).

References (PEDMS-14)

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Limb Length Discrepancy (PEDMS-15)

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Limb Length Discrepancy (PEDMS-15)

MSP.LL.0015.A

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- Limb length discrepancy imaging indications in pediatric individuals are identical to those in the general imaging guidelines. Please use: **Limb Length Discrepancy (MS-17.0)** in the Musculoskeletal Imaging Guidelines.

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

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

MPS.CD.0016.1.A
v1.0.2027

Criteria

- Plain x-rays should be performed initially since the calcaneonavicular bar is readily visible in individuals where ossification has started or is complete.
  - Talocalcaneal coalition is more difficult to evaluate on plain x-rays.
- CT without contrast (CPT® 73700) or MRI without contrast (CPT® 73718) is considered medically necessary if tarsal coalition is suspected (because of restricted hindfoot motion on physical exam), and plain x-rays are inconclusive.

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Club Foot (PEDMS-16.2)

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Criteria

- Plain x-rays should be performed initially since the anomaly is readily visible in individuals where ossification has started or is complete.
- Ultrasound (CPT® 76881 or 76882) is considered medically necessary to characterize the cartilaginous tarsal bones and demonstrate tarsal bone alignment in infants with non-ossified tarsal bones.
- MRI (CPT® 73718) or CT (CPT® 73700) is considered medically necessary to determine residual deficits following repair.
  - Ultrasound is not required prior to MRI or CT if those studies are appropriate.

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Vertical Talus (PEDMS-16.3)

MSP.CD.0016.3.C
v1.0.2027

Criteria

- Plain x-rays should be performed initially since the anomaly is readily visible in individuals where ossification has started or is complete.
- MRI (CPT® 73718) or CT (CPT® 73700) are considered medically necessary to determine residual deficits following repair.

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Femoral Anteversion and Tibial Torsion (PEDMS-16.4)

MSP.CD.0016.4.C
v1.0.2027

Criteria

- 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® 73700) OR MRI Lower Extremity without contrast (CPT® 73718) is considered medically necessary for preoperative evaluation.

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Evidence Discussion (PEDMS-16)

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Radiographs are recommended as first-line imaging for most pediatric foot and lower extremity deformities to assess osseous alignment. However, they can have reduced sensitivity in non-ossified cartilage and early disease. Ultrasound can be a radiation-free imaging option useful in infants and young children where their bones have not yet ossified for conditions such as clubfoot and vertical talus (Hammer et al., 2019; Wise et al., 2020; Miron & Grimard, 2016; Waelti et al., 2022). Advanced imaging (MRI or CT) is typically reserved for complex, atypical, or pre-surgical planning cases after initial imaging (Denning, 2016; Machida et al., 2017; Wise et al., 2020; Winell & Davidson, 2020a, 2020b).

MRI provides high sensitivity for detecting soft tissue, cartilaginous abnormalities, and bone marrow changes of the foot and lower extremity (Wise et al., 2020; Denning, 2016). MRI is preferred when radiation avoidance is prioritized or when detailed soft tissue characterization is required (Wise et al., 2020; Hesham et al., 2017). MRI is equivalent to CT in accuracy and reproducibility for femoral version measurement in pediatric patients, without ionizing radiation (Hesham et al., 2017).

CT provides superior osseous detail and is considered the reference standard for defining complex bony anatomy such as tarsal coalition and rotational deformities (Wise et al., 2020; Denning, 2016). CT has high diagnostic accuracy for torsional measurements of the lower extremities, traditionally considered the gold standard (Waelti et al., 2022). Ultra-low-dose CT protocols significantly reduce radiation exposure while maintaining diagnostic performance in children (Waelti et al., 2022).

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Procedure Codes Associated with Pediatric Musculoskeletal Imaging (PEDMS)

Guideline Page

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Procedure Codes Associated with Musculoskeletal Imaging (PEDMS)

MSP.GG.ProcedureCodes.C
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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 Lower Extremity	73725

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CT	CPT®
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®
CTA Upper Extremity	73206
CTA Lower Extremity	73706

Ultrasound	CPT®
Ultrasound, extremity, nonvascular; complete joint	76881
Ultrasound, extremity, nonvascular; limited, anatomic specific for focal abnormality	76882

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Ultrasound	CPT®
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

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