MedSolutions, Inc. Clinical Decision Support Tool
Diagnostic Strategies

This tool addresses common symptoms and symptom complexes. Imaging requests for patients with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician, specialist and/or patient’s Primary Care Physician (PCP) may provide additional insight.

PEDIATRIC MUSCULOSKELETAL IMAGING GUIDELINES
Version 17.0; Effective 02-16-2015

MedSolutions, Inc. Clinical Decision Support Tool
for Advanced Diagnostic Imaging

Common symptoms and symptom complexes are addressed by this tool. Imaging requests for patients with atypical symptoms or clinical presentations that are not specifically addressed will require physician review. Consultation with the referring physician may provide additional insight.

This version incorporates MSI accepted revisions prior to 12/31/14

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©2015 MedSolutions, Inc. Pediatric Musculoskeletal Imaging Guidelines
# Pediatric Musculoskeletal Imaging Guidelines

## Disease/Injury Category (Alphabetical Order)

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## Anatomical Areas

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<th>Area</th>
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The Musculoskeletal Imaging Guidelines are the same for both the pediatric population and the adult population, unless there are specific guidelines listed here in the Pediatric Musculoskeletal Imaging Guidelines. These guidelines will attempt to guide the clinician in the most appropriate use of musculoskeletal imaging.

The guidelines are divided into two basic sections:

1. Disease/Injury Category and
2. Anatomical Area Category.

Some conditions, e.g., tumors can occur in any area and some, e.g., torn meniscus are specific to certain anatomical areas.

These guidelines are diagnosis oriented so it is imperative that the reviewer have a working/tentative diagnosis prior to review.

A clinical evaluation within 60 days is required before advanced imaging can be considered and should include a relevant history and physical examination, appropriate laboratory studies, and non-advanced imaging modalities.

- Other meaningful contact (telephone call, electronic mail or messaging) by an established patient can substitute for a face-to-face clinical evaluation.
- A “clinical diagnosis” for many musculoskeletal bone, joint and soft tissue pain, and injury disorders are based on a relevant history, physical examination and plain x-ray.

Prior to advanced imaging consideration, an x-ray must be performed after the current episode of symptoms started or changed for all musculoskeletal conditions.

Physician-directed conservative care may include 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 physician directed home exercise program, cross-training, and/or physical medicine, or immobilization by splinting/casting/bracing.

Orthopedic specialist evaluation can be helpful in determining the need for advanced imaging.

These guidelines are based upon using advanced imaging to answer specific clinical questions that will affect patient management. Imaging is not indicated if the results will not affect patient management decisions. Standard medical practice would dictate continuing conservative therapy prior to advanced imaging in patients who are improving on current treatment programs.
Plain x-ray should be done prior to advanced imaging in most musculoskeletal conditions to rule out those situations that do not require advanced imaging, such as osteoarthritis, acute/healing fracture, osteomyelitis, and tumors of bone amenable to biopsy or radiation therapy (in known metastatic disease), etc.

Even in soft tissue masses, plain x-rays are helpful in evaluating for calcium/bony deposits, e.g. myositis ossificans and invasion of bone.

**PACMS-2.1 Ultrasound of the Hips**

Ultrasound should be the initial imaging study for evaluation of conditions such as congenital hip dysplasia or hip effusion (See: PACMS-12~Hip Dysplasia).

<table>
<thead>
<tr>
<th>Ultrasound Procedure Coding</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>CPT®76885</td>
<td>Ultrasound, infant hips, real time with image documentation; dynamic (requiring physician manipulation)</td>
</tr>
<tr>
<td>CPT®76886</td>
<td>Ultrasound, infant hips, real time with image documentation; limited, static (not requiring physician manipulation)</td>
</tr>
</tbody>
</table>

CPT®76885 and CPT®76886 should not be ordered together on the same case nor billed together for the same date of service.

<table>
<thead>
<tr>
<th>Ultrasound Coding for Examination of a Soft Tissue Mass</th>
<th>Description</th>
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<tr>
<td>CPT®76882</td>
<td>Axilla</td>
</tr>
<tr>
<td>CPT®76604</td>
<td>Chest wall</td>
</tr>
<tr>
<td>CPT®76604</td>
<td>Upper back</td>
</tr>
<tr>
<td>CPT®76705</td>
<td>Lower back</td>
</tr>
<tr>
<td>CPT®76705</td>
<td>Abdominal wall</td>
</tr>
<tr>
<td>CPT®76999</td>
<td>Other soft tissue areas</td>
</tr>
</tbody>
</table>

Extremity ultrasound: (non-vascular)—CPT®76881 (complete) or CPT®76882 (limited, anatomic specific)
PACMS-2.2 MRI versus CT

In general MRI is the preferred imaging modality in musculoskeletal conditions because 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).

CT is better at 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 if plain x-rays are equivocal.

PACMS-2.3 Contrast Issues

✓ Most musculoskeletal imaging (MRI or CT) is without contrast.

Exceptions include:

- Tumors and osteomyelitis (without and with contrast)
- Post-arthrogram MR, post-myelogram CT, post-discogram CT (with contrast only)
- MRI for rheumatoid arthritis (generally with contrast only)
- In postoperative joint studies, MRI with contrast (direct or indirect arthrogram) can be approved if requested.

References

1. ACR Appropriateness Criteria, Musculoskeletal Imaging topics
PACMS-3~3-D Rendering

PACMS-3.1 3-D Rendering

See: MS-3~3D Rendering
Legg-Perthe’s Disease AVN of the Hip occurs in children when the femoral head loses its blood supply. It affects children between the ages of 4 and 8 (occasionally younger and older). Clinically is quite different than adult AVN since there is good healing potential of the femoral head (especially in younger children). Treatment is observation in mild cases and containment of the head within the acetabulum by abduction bracing in more severe cases.

**PACMS-4.1 AVN**

- Plain x-ray is the initial imaging study and may be all that is necessary for follow-up.
- If the diagnosis is uncertain on plain x-ray, hip MRI without contrast (either unilateral CPT®73721 or pelvis CPT®72195) can be approved.
- Patients with acute lymphoblastic leukemia and known or suspected osteonecrosis should be imaged according to guidelines in: **PACONC-3.2 Acute Lymphoblastic Leukemia**.
- Known or suspected osteonecrosis in long term cancer survivors should be imaged according to guidelines in: **PACONC-19.4 Osteonecrosis in Long Term Cancer Survivors**.

**References**

PACMS-5~Fracture and Dislocation

**PACMS-5.1 Acute**

- 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 joint fractures where noncontrast CT is helpful.\(^1\,^2\) See also: **MS-3~3D Rendering**

  - If plain x-rays are negative or equivocal for fracture, and fracture is still clinically suspected, CT or MRI without contrast can be performed if the results will determine immediate treatment decisions as documented by the treating physician.

**Fracture of the Clavicle**

- Advanced imaging is rarely indicated

  - If requested by the treating surgeon, MRI without contrast (CPT\(^{®}\) 71550) or CT (CPT\(^{®}\) 71250 or CPT\(^{®}\) 76380) can be performed for preoperative planning.

  - CT without contrast (CPT\(^{®}\) 71250 or CPT\(^{®}\) 76380) can be performed if there is concern for non-union of a fracture that has been treated non-operatively.

**PACMS-5.2 Joint**

- CT can be approved in complex fractures involving a joint for preoperative planning.

- Orthopedic evaluation is helpful in determining the need for advanced imaging.

**PACMS-5.3 Metaphysis (end of bone)/Diaphysis (shaft of bone)**

- These fractures can generally be diagnosed and managed adequately with plain x-ray.

  - If there is concern for delayed union or non-union of the bone, CT without contrast is appropriate.

  - MRI without contrast for the evaluation of physeal bar in juxtaphyseal fracture (especially when referred by an orthopedic surgeon)

**PACMS-5.4 Osteochondral/Chondral/Osteochondritis Dissecans**

- If x-rays are negative and an osteochondral fracture is still suspected, or if x-ray or clinical exam suggest loose fragment, MRI without contrast, MR arthrogram, or CT arthrogram is the appropriate next imaging study.

  - If plain x-rays show a non-displaced osteochondral fragment, follow up imaging should be with plain x-rays.
✓ CT without contrast should be reserved for circumstances in which there is a question of healing on follow up plain x-rays.

**PACMS-5.5 Stress/Occult Fracture**

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

✓ Plain x-rays should be performed initially. Plain x-rays are usually negative initially and become positive at 3-4 weeks in stress fractures and 10-14 days in occult fractures. Bone scan will be positive within 72 hours of onset.

✓ Periodic follow-up plain x-rays will usually show progressive healing. Except in situations where there is concern for non-union, advanced imaging is not routinely performed.

✓ If the initial evaluation of history, physical exam, and either plain x-ray or bone scan fail to establish a definitive diagnosis of stress fracture in an individual with **suspected hip, femur, or tibial stress fracture**, noncontrast MRI or CT can be performed without waiting for 3 to 4 weeks or obtaining follow-up plain x-rays.

✓ For all other suspected stress fractures, noncontrast MRI or CT can be performed if plain x-rays are negative after 3 to 4 weeks of conservative therapy and stress fracture is still suspected.

**PACMS-5.6 Compartment Syndrome**

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

**PACMS-5.7 Other Indications**

✓ CT or MRI without contrast is appropriate after plain x-ray if one of the following is present:
  
  o Concern for delayed union or non-union of fracture or joint fusions.
  
  o As part of pre-operative evaluation for a planned surgery of a complex fracture/dislocation.

**References**

2. Rosemont, IL, Academy of Orthopaedic Surgeons, 2005, pp.30-33
3. ACR Appropriateness Criteria®, Chronic hip pain, 2008
4. ACR Appropriateness Criteria®, Acute hand and wrist trauma, 2008
5. ACR Appropriateness Criteria®, Chronic ankle pain, 2009
6. ACR Appropriateness Criteria®, Stress (fatigue/insufficiency fracture, including sacrum, excluding other vertebrae, 2011
PACMS-6~Foreign Body

PACMS-6.1 Foreign Body

See: MS-6.1 Foreign Body – General

Reference

PACMS-7.1 General Considerations

History and Physical examination: information should include location, size, and duration, solid/cystic, fixed/not fixed to bone. Orthopedic or Surgical evaluation is helpful in determining the need for advanced imaging.

✓ Plain x-rays should be performed initially (see: PACMS-2~Imaging Techniques).
✓ Most discrete masses warrant imaging (usually MRI without and with contrast). **Exceptions:** advanced imaging is generally not indicated for the following entities:
  o Ganglia
  o Sebaceous cyst
  o Subcutaneous lipoma does not require imaging for diagnosis
    • Evaluation by a dermatologist or surgeon is helpful in determining the need for advanced imaging.
    • If the clinical exam is equivocal, ultrasound should be performed initially.
    • Noncontrast MRI can be performed if surgery is planned.

✓ Lipomas in other locations (not subcutaneous) should be evaluated by CT without and with contrast or by ultrasound
  o Lesions with Hounsfield units less than -50 HU do not require additional imaging except for surgical planning.
  o Noncontrast MRI can be considered if ultrasound and/or CT are equivocal, or for preoperative planning.

✓ For ill-defined mass/swelling: ultrasound should be performed as the initial study
  o Mass that has been present and stable for 1 year
  o Most hematomas can be adequately imaged by ultrasound.

✓ MRI without and with contrast for all other patients

PACMS-7.2 Soft Tissue Mass with Negative X-ray

✓ MRI (contrast as requested) can be performed (ultrasound or CT with contrast if MRI is contraindicated)

PACMS-7.3 Soft Tissue Mass with Calcification/Ossification on X-ray

✓ MRI without and with contrast if clinical findings, plain X-ray and/or CT, do not suggest Myositis Ossificans
PACMS-7.4 Bone or Attached to Bone (including lytic and blastic metastatic disease)

✓ Many benign bone tumors have a characteristic appearance on plain X-ray and advanced imaging is not necessary unless one of the following applies:
  o Imaging requested for preoperative planning (MRI without and with contrast and/or CT without and with contrast may be indicated)
  o Diagnosis uncertain based on plain X-ray appearance

✓ MRI without and with contrast is appropriate for patients with osteochondroma with new or worsening pain symptoms or a change on a recent plain X-ray that suggests malignant transformation

✓ Known benign bone tumors, Osteogenic Sarcoma, and Ewing Sarcoma Family of Tumors should be imaged according to PACONC-9 Bone Tumors.

References
1. ACR Appropriateness Criteria®, Primary bone tumors, 2009
3. ACR Appropriateness Criteria, Soft tissue masses, 2009
PACMS-8.1 Muscle/Tendon Unit Injuries/Diseases

Almost all complete tendon ruptures can be diagnosed by physical exam showing loss of function of the affected joint and/or palpable disruption of the involved tendon.

✓ If history and physical exam point to a suspected partial tendon rupture of a specific tendon named in the clinical information, then MRI without contrast is appropriate.

Muscle belly strains/muscle tears can be diagnosed clinically by history and physical exam. Although MRI is positive, it is not needed for diagnosis.

For acute strains, treatment initially consists of rest, application of ice, compression and avoidance of painful activity. Surgical treatment is generally not recommended, even for complete tears. Muscle tissue is not amenable to surgical repair.

Inflammatory myopathies (polymyositis, dermatomyositis, inclusion body myositis, myositis of malignancy)

  o Also see: PACPN-4~Inflammatory Muscle Diseases in the Pediatric Peripheral Nerve Disorders Imaging Guidelines.

References

1. *ACR Appropriateness Criteria ©, Chronic ankle pain*, 2009
ANATOMICAL AREAS

PACMS-9~Osgood-Schlatter’s Disease

**PACMS-9.1 Osgood-Schlatter’s Disease**

This is defined as traction apophysitis of the tibial tubercle in skeletally immature individuals. Diagnosis is by clinical examination and x-ray, and treatment is conservative. Advanced imaging is not generally indicated in this disorder.

**References**


PACMS-10~Knee – Baker’s Cyst

**PACMS-10.1 Knee – Baker’s Cyst**

Baker’s cyst in children is a different clinical situation than in adults and is almost never due to intra-articular pathology. Usually treated conservatively and rarely requires surgery.

✓ Ultrasound (CPT®76881 or CPT®76882) is the appropriate imaging study.

**Reference**

PACMS-11.1 SCFE

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

Physical examination:
- Hip examination shows painful motion, loss of internal rotation, and there is often a discernable external rotation deformity of the extremity.
- Knee examination is always normal (no swelling, instability, joint line tenderness, erythema, or warmth).
- The distal neurovascular examination is always normal.

Imaging studies:
- Anteroposterior and lateral x-rays (frog leg or cross table lateral) of both hips will confirm or exclude the diagnosis.
- Advanced imaging is not generally indicated.

Reference
1. *Am Fam Physician* 1998 May 1;57(9):2135
PACMS-12~HIP Dysplasia (Developmental Dysplasia of the Hip)

PACMS-12.1 Hip Dysplasia

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 dislocatable hip and mild subluxation to fixed dislocation. Sixty to 80% of abnormalities are identified by physical exam, and more than 90% are identified by ultrasound.

Screening studies:

✓ The routine use of ultrasound in screening all neonates and infants for DDH is not recommended by the American Academy of Pediatrics.

✓ Screening ultrasound (CPT®76885 or CPT®76886) for “at risk” infants is usually performed at 4 to 6 weeks of age.
  ○ “At risk” includes positive family history, breech presentation, foot deformities, oligohydramnios, and torticollis.

✓ Indications for hip ultrasound (CPT®76885 or CPT®76886):
  o Screening study for “at risk” infants as described above
  o 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) and infant is between 2 weeks old and 6 months old.
  o Type IIa hip was diagnosed on a previous hip ultrasound using the Graf method and follow-up hip ultrasound is requested to confirm normal development.

✓ Hip ultrasound is NOT indicated for the following:
  o Infants less than 2 weeks of age: hip laxity is common after birth and often resolves.
  o Infants older than 6 months of age: 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.
  o 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.
  o Plain x-ray of the hips should be performed rather than ultrasound if there is a clinical suspicion for teratogenic dysplasia.

References

1. ACR Appropriateness Criteria, Developmental dysplasia of the hip—child, 2010
3. Lancet 2007;369(9572):1541-1552
PACMS-13~Limb Length Discrepancy

PACMS-13.1 Leg Length Discrepancy

See MS-17.1~Limb Length Discrepancy

Reference
**ANATOMICAL AREAS**

**PACMS-14~Foot-Congenital Anomalies**

**PACMS-14.1 Tarsal Coalition (Calcaneonavicular Bar/Rigid Flat Foot)**

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

**PACMS-14.2 Club Foot**

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

- MRI or CT without contrast (CPT®73700 or CPT®73718) can be approved if requested by the treating specialist, usually as a preoperative evaluation.

**References**