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, specialist and/or patient’s Primary Care Physician (PCP) may provide additional insight.

This version incorporates MSI accepted revisions prior to 12/18/09
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### Abbreviations for Musculoskeletal Guidelines

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<td>anteroposterior view</td>
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<td>AVN</td>
<td>avascular necrosis</td>
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<tr>
<td>CMS</td>
<td>Centers for Medicare and Medicaid Services</td>
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<td>CPK</td>
<td>creatinine phosphokinase</td>
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<td>CT</td>
<td>computed tomography</td>
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<td>DEXA (DXA)</td>
<td>dual energy x-ray absorptiometry</td>
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<td>DMARDS</td>
<td>disease modifying anti-rheumatic drugs</td>
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<td>EMG</td>
<td>electromyogram</td>
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<td>ESR</td>
<td>erythrocyte sedimentation rate</td>
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<td>MRI</td>
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<td>NCV</td>
<td>nerve conduction velocity</td>
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<td>NSAIDS</td>
<td>non steroidal anti-inflammatory drugs</td>
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<td>RA</td>
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<td>RICE</td>
<td>rest, ice, compression, elevation</td>
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<td>SI</td>
<td>sacro-iliac</td>
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<td>TNF</td>
<td>tumor necrosis factor</td>
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<td>WBC</td>
<td>white blood cell count</td>
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MUSCULOSKELETAL IMAGING GUIDELINES

MS-1~GENERAL GUIDELINES

- Advanced imaging can be ordered in almost any musculoskeletal condition and does show abnormality in most musculoskeletal conditions, however, that does not mean that it is indicated in these situations.
- 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.
  - Prior to considering advanced imaging, patients should undergo a recent detailed history, physical examination, appropriate laboratory studies, and the use of non advanced imaging modalities such as plain x-ray.
  - Advanced imaging should serve as an adjunct in arriving at a more definitive diagnosis.
  - 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.

MS-2~IMAGING TECHNIQUES

- 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.
    *ACR Appropriateness Criteria, Musculoskeletal Imaging topics
  - Even in soft tissue masses, plain x-rays are helpful in evaluating for calcium/bony deposits, e.g. myositis ossificans and invasion of bone.
- MRI vs. 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) and dislocations, as well as assessment of fracture union if plain x-rays are equivocal.

- Tibia/fibula imaging is reported as a single CPT® code (MRI or CT of the lower extremity other than joint)

**Contrast Issues**
- Most musculoskeletal imaging (MRI or CT) is without contrast.
  - **Exceptions:**
    - Tumors and osteomyelitis (without and with contrast)
    - MR arthrograms, CT myelogram, CT for discogram (with contrast only)
    - MRI for rheumatoid arthritis (contrast as requested)
    - In postoperative joint studies, MRI with contrast (direct or indirect arthrogram) can be approved if requested.

### MS-3~3-D RENDERING

- CMS approves 3-D rendering both on an independent workstation (CPT®76377) and on a non-independent workstation (CPT®76376) if they are medically necessary.
  - However, certain health plans do not reimburse these 3-D CPT® codes and their coverage policies will take precedence over MedSolutions’ guidelines. Prior authorization does not guarantee payment of the study.

- Musculoskeletal indications for 3-D imaging are as follows:
  - Complex fractures of any joint or the pelvis
  - Spine fractures
  - Preoperative planning in complex surgical cases*
    - These requests should be sent for Medical Director review.

  *ACR 2006 Coding Update Sept/Oct 2005

### DISEASE/INJURY CATEGORY (ALPHABETICAL ORDER)

#### MS-4~AVASCULAR NECROSIS (AVN)

- If AVN is suspected, plain x-rays should be performed initially.
- If plain x-rays are positive, no further imaging is necessary, as follow-up can be performed with plain x-rays.
- MRI without contrast is the modality of choice to evaluate suspected AVN with negative X-rays.
- Either unilateral hip MRI (CPT®73721) can be performed to visualize one hip, or pelvis MRI (CPT®72195) can be performed if bilateral hips need to be imaged.

  ![ACR Appropriateness Criteria, Chronic Hip Pain, 2008](http://www.acr.org)

MS-5~FRACTURE AND DISLOCATION

- **MS-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.
  - If plain x-rays are negative or equivocal for fracture, and fracture is still clinically suspected, a several week trial of conservative therapy with periodic clinical re-evaluation and repeat x-rays is indicated prior to considering advanced imaging.
    - CT or MRI without contrast can be performed sooner if the results will determine immediate treatment decisions as documented by the treating physician (e.g. fractures of the scaphoid, femoral neck and shaft, tibia, acetabulum).
  - Orthopedic evaluation is helpful in determining the appropriate imaging pathway.

1. ACR Appropriateness Criteria, Acute hand and wrist trauma, 2008

- **Fracture of the Clavicle**
  - Advanced imaging is rarely indicated
  - If requested by the treating surgeon, noncontrast MRI (CPT®71550) or CT (CPT®71250 or CPT®76380) can be performed for preoperative planning.
  - Noncontrast CT (CPT®71250 or CPT®76380) can be performed if there is concern for non-union of a fracture that has been treated non-operatively.

- **MS-5.2 Joint**
  - CT can be approved in complex fractures involving a joint for preoperative planning.*

*Greene WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, p.41
*ACR Appropriateness Criteria, Acute hand and wrist trauma, 2008

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

- **MS-5.3 Metaphysis (end of bone)/Diaphysis (shaft of bone)**
  - These fractures can generally be managed adequately with plain x-ray.
  - If there is concern for delayed union or non-union of the bone, CT without contrast is appropriate.

- **MS-5.4 Osteochondral/Chondral**
  - These fractures are joint fractures essentially of the joint surface (a piece of bone with attached cartilage, or a piece of cartilage alone).
  - If x-rays are negative and an osteochondral fracture is still suspected, 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.

**Reference:**
- ACR Appropriateness Criteria, Chronic ankle pain, 2009

### MS-5.5 Stress/Occult Fracture

- These fractures, almost always in weight bearing bones, can be evaluated adequately by history, physical exam, plain x-ray and bone scan.
- Plain x-rays should be performed initially.
- A history of increased physical activity is often elicited and swelling and tenderness are present on exam.
- Plain x-rays are usually negative initially and become positive at 3-4 weeks. Bone scan will be positive within 72 hours of onset.
- Treatment includes protected weight bearing with or without casting. Occasionally surgery is necessary for non-unions.
- 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.

**Exceptions:**
- Hip, femur, and tibial stress fractures--MRI without contrast or CT without contrast can be approved if stress fracture is suspected because prolonged healing with a poor outcome can occur with delayed diagnosis.
- If bone scan is not feasible (e.g. due to Tc-99m shortage) MRI without contrast of the suspected fracture site can be performed.

**References:**
- ACR Appropriateness Criteria, Stress/insufficiency fracture, 2008

### MS-5.6 Compartment Syndrome

- Caused by swelling in the closed compartments of the extremities
- Advanced imaging is not indicated
- Diagnosis is made clinically and by direct measurement of compartment pressure and is a surgical emergency*


### MS-6~FOREIGN BODY

- MRI (contrast as requested) can be approved after plain x-rays rule out the presence of radiopaque foreign bodies.*

*Am Fam Physician 2003 June;67(12):2557-2562
**MS-7~GANGLION CYSTS**

- Ganglions are small sacs (cysts) filled with clear, jellylike fluid.
- A ganglion can usually be diagnosed by its appearance and location.
- Some of the fluid found in the ganglion may be removed and examined.
- X-ray may be done if osteoarthritis or injury is suspected, but will not be done only to diagnose the ganglion.
- In rare cases (usually in suspected occult ganglia), noncontrast MRI or ultrasound is used to evaluate unusual ganglions.
- Ganglions usually do not need treatment and often resolve on their own.

**Reference:**

**MS-8~GOUT/PSEUDOGOUT/CRYSTAL DEPOSITION DISEASE**

- The diagnosis of crystal deposition disease (e.g. gout, pseudogout) is confirmed by the presence of polymorphonuclear leukocytes and intracellular monosodium urate crystals or calcium pyrophosphate crystals in synovial fluid aspirated from an inflamed joint.
- Radiographic findings are generally nonspecific except in chondrocalcinosis (pseudogout) which can often be diagnosed from plain x-rays alone.
  - Advanced imaging is not used routinely in the evaluation of crystal deposition disease since the findings are those of nonspecific inflammation.
  - Rarely, a gouty tophus may mimic an infectious or neoplastic process. In this instance, MRI evaluation is indicated.

**Reference:**
- Am Fam Physician 1999 April;59(7):1799-1806,1810

**MS-9~INFECTION**

**MS-9.1 General Considerations**
- History and Physical exam—information should include location, open/closed, systemic signs, cultures performed?
- Plain x-ray initially to rule out extension either into or out of bone and to look for gas in soft tissues which is seen in *Clostridium perfringens* and other gas forming infections.*
- CT scan shows anatomy (e.g. bony destruction) better than plain x-rays, but its use should be discouraged in favor of the more definitive MRI if advanced imaging is indicated.
  - CT can be approved in the setting of negative plain x-rays and contraindication to MRI.
**MS-9.2 Soft Tissue Infections**
- MRI without and with contrast can be performed if plain x-rays are negative, patient is not responding to therapy, and abscess is suspected.
- MRI is useful in determining the exact extent and location of an abscess when planning for surgery.

**MS-9.3 Bone (Osteomyelitis)**
- MRI without and with contrast if plain x-rays are negative.*
  
- If plain x-rays are positive, there is generally no need for advanced imaging unless the physician (usually Orthopedic or Infectious Disease specialist) is looking for necrotic bone.

**MS-9.4 Joint Infections**
- Septic arthritis can almost always be diagnosed by history, physical examination, and joint aspiration with cell count and culture.*
  
  *Acute septic arthritis is an urgent/emergent surgical problem and should almost never be evaluated in an outpatient setting.
  
  *Am Fam Physician 2000 April;61(8):2391-2400

**MS-10~MASS**

**MS-10.1 General Considerations**
- History and Physical exam--information should include location, size, duration, whether growing or stable, solid/cystic, fixed/not fixed to bone
- Plain x-rays should be performed initially (see MS-2 Imaging Techniques).
- Most discrete masses warrant imaging (usually MRI without and with contrast).
- **Exceptions**- advanced imaging is generally not indicated for these entities:
  - Ganglia
  - Sebaceous cyst
  - 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 ultrasound or CT without and with contrast.
    - Lesions with Hounsfield units less than -50 HU do not require additional imaging except for surgical planning.*
    - Noncontrast MRI can be considered if ultrasound and/or CT are equivocal, or for preoperative planning.
Ill-defined mass/swelling: ultrasound should be performed as the initial study
Mass that has been present and stable for 1 year
Most hematomas can be adequately imaged by ultrasound.*


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

**MS-10.2 Soft Tissue Mass with Negative X-ray**
- MRI (contrast as requested) can be performed (Ultrasound or CT with contrast if MRI contraindicated)*

*ACR Appropriateness Criteria, Soft tissue masses, 2009

**MS-10.3 Soft Tissue Mass with Calcification/Ossification on X-ray**
- CT without contrast if Myositis Ossificans (bone formation in muscle tissue after trauma) is suspected.*

*ACR Appropriateness Criteria, Soft tissue masses, 2009
- MRI without and with contrast if not demonstrated to be Myositis Ossificans by CT*

*ACR Appropriateness Criteria, Soft tissue masses, 2009

**MS-10.4 Bone or Attached to Bone (including lytic and blastic metastatic disease)**
- MRI (contrast as requested) can be performed; (CT without and with contrast if MRI is contraindicated)*

*ACR Appropriateness Criteria, Primary bone tumors, 2009

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### MS-11~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.¹
- Muscle belly strains/muscle tears can be diagnosed clinically by history and physical exam. Although MRI is positive, it is not needed for diagnosis.²
- 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.*

*Am Fam Physician1999 Oct;60(6):1687-1696

- Inflammatory myopathies (polymyositis, dermatomyositis, inclusion body myositis, myositis of malignancy)
  - Also see PN-6.2 Inflammatory Muscle Diseases in the Peripheral Nerve Disorders Imaging Guidelines
MS-12~OSTEOARTHRITIS

- Plain x-rays should be performed initially,\(^1,2\) which will most often reveal “characteristic joint space narrowing and osteophytic spurring.”
- Treatment is conservative and might include weight reduction if necessary, acetaminophen, NSAIDs, exercise, intraarticular steroid injection, and in severe cases, joint replacement.\(^3,4\)
- Advanced imaging is usually not necessary \(^3,4,5\) except in special circumstances—e.g. suspected concomitant internal derangement of the knee, labral tear of the hip, labral tear or rotator cuff tear of the shoulder (MRI without contrast; MRI with contrast for labral tear), and preoperative planning in joint replacement (CT without contrast).
  - \(^1\) ACR Appropriateness Criteria, Chronic ankle pain, 2009
  - \(^2\) Greene WB (Ed.). Essentials of Musculoskeletal Care. 2\textsuperscript{nd} Ed. Rosemont, IL, Academy of Orthopaedic Surgeons, 2001, p.330
  - \(^4\) Am Fam Physician 2000 March;61(6):1795-1804
  - \(^5\) Greene WB (Ed.). Essentials of Musculoskeletal Care. 2\textsuperscript{nd} Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, pp 320-321

MS-13~OSTEOCHONDRTIS DISSECONS

- A condition of uncertain etiology sometimes attributed to avascular necrosis (AVN) or trauma.
- Can heal if non-displaced.
- Plain x-rays should be performed initially.*
  - *ACR Appropriateness Criteria, Non traumatic knee pain, 2008
- MRI or CT without contrast after 8-12 weeks to evaluate healing can be approved if follow-up plain x-rays are equivocal.

MS-14~OSTEOPOROSIS

- Patients at risk include postmenopausal women over age 65, patients on bedrest, patients on steroids, and alcoholics.
- At particularly high risk is the female at any age with early surgical menopause post hysterectomy.
- DEXA scan is recommended for all patients at risk.
- DEXA scan is the modality of choice for screening and therapeutic follow-up in patients with suspected/known osteoporosis.\(^1,2\)
- CMS allows imaging every two years for the following:
- Estrogen deficient female
- Patients with osteopenia or fracture on spine films
- Patients on long term steroid therapy
- Patients with primary hyperparathyroidism
- Patients under treatment for osteoporosis

Quantitative CT scan (**CPT® 77078** which replaces CPT®76070 for CT bone mineral density study, axial skeleton) can be approved in the following special circumstances where DEXA scan is known to be inaccurate:
- Multiple healed compression fractures
- Significant scoliosis
- Severe degenerative disk disease due to increased cortical sclerosis with large marginal osteophytes
- Follow-up in cases where Quantitative CT was the original study
- Morbidly obese patients


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**MS-15~PAGET’S DISEASE**

- Paget’s Disease is asymptomatic in the majority of cases, but pain can sometimes be severe.
- Diagnosis is by laboratory results (marked elevation of alkaline phosphatase) and findings on plain x-ray.
- MRI without contrast can be performed if the diagnosis is in doubt or if malignant degeneration is suspected (occurs in up to 10% of the cases).
- Reference:
  - *Am Fam Physician* 2002 May;65(10):2069-2072

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**MS-16~POST OPERATIVE EVALUATION**

- Diagnosing the etiology of pain or other symptoms after surgery can be a difficult diagnostic problem.
- Knowledge of the complications of the specific orthopedic procedure performed and of the usual post-operative course of that procedure is important.
- The imaging choices in evaluating symptomatic post-operative patients can be complicated.
- Orthopedic evaluation is extremely helpful in determining the appropriate imaging pathway and to interpret the significance of imaging findings in the postoperative setting.
The rheumatologic disorders are usually recognized by clinical patterns supplemented by laboratory tests of immune reactions.

MRI is increasingly being used in clinical trials to study the effects of treatment with DMARDs and in clinical practice to identify seronegative RA patients that might benefit from early DMARD therapy.*

*Haller J, Hofmann J. Inflammatory Joint Diseases.

Prior to advanced imaging, physical exam, laboratory studies and plain x-rays should be performed.

If a diagnosis of RA is still uncertain, then MRI (contrast as requested) of the most symptomatic joint, or of the dominant hand or wrist* can be considered to establish the diagnosis prior to institution of therapy with potent therapeutic agents.

*J Rheumatol 2001;28(5):1158-1161

If MRI is stated to be the chief factor in determining whether or not to switch from standard DMARD therapy to tumor necrosis factor (TNF) therapy or to change to a different TNF drug, then one MRI (contrast as requested) of a single joint can be performed.

Advanced imaging is not indicated to routinely follow the results of treatment.

Neither evidence-based nor consensus guidelines for the use of serial follow up MRI scans in RA patients have been established due to multiple factors including:

- Lack of a good reproducible scoring system for erosions, bone edema, and synovitis (the primary lesion in Rheumatoid Arthritis1)
- Disagreement on the relationship between synovitis and erosions
- Differences of opinion on use of contrast
- Low versus high field magnet discussion

There are no well-controlled large cohort studies relating MRI use to improved clinical outcomes.2

1 J Rheumatol 2005;32(12):2462-2464
2 J Rheumatol 2005;32(12):2465-2469
2 J Rheumatol 2003;30(4):671-679
2 Joint Bone Spine 2005;72:229-234

MRI without contrast can be approved in special situations in RA, such as suspected internal derangement in the knee (see MS-26 Knee) or rotator cuff tear in the shoulder (see MS-20 Shoulder).
**MS-18~TENDONITIS/ BURSITIS**

- Plain x-rays first to rule out entities such as calcific tendonitis/bursitis.*
  
  "Am Fam Physician 1998 Feb;57(4):667-674"

- A trial of at least 6 to 8 weeks of conservative therapy which might include NSAIDS/cortisone dosepack/cortisone injection/physical therapy is warranted prior to considering advanced imaging.

- Advanced imaging is rarely indicated in tendinitis/bursitis and is only performed if there is suspicion of another problem.*


- MRI without contrast is the appropriate study if advanced imaging is indicated.

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

**MS-19~TOTAL JOINT PROSTHESIS**

- Imaging in painful total joint prostheses is complicated.

- Plain x-rays should be performed initially to rule out obvious loosening and periprosthetic fracture.

- Standard technetium bone scan has good sensitivity, but poor specificity* being positive in any condition causing inflammatory response including aseptic loosening.


- PET is under investigation, but also has decreased specificity because it is positive in most cases of aseptic loosening.**

  18F-FDG imaging is less accurate than, and is not a suitable replacement for, leukocyte/marrow imaging [bone scan with Indium labeled WBC’s] for diagnosing infection of the failed joint replacement." **

- Prosthetic artifact limits the usefulness of CT and MRI.**

  "J Nucl Med 2004;45(11):1864-1871"

- Therefore, leukocyte/marrow imaging (bone scan with Indium labeled WBC’s) should be the initial imaging study in evaluating possible infection versus aseptic loosening of a joint prosthesis.

- Orthopedic specialist evaluation is helpful in determining the appropriate imaging pathway in these patients.
ANATOMICAL AREAS

General Considerations
- Areas are organized from head to toe. Plain x-ray should almost always be performed prior to advanced imaging (see MS-2 Imaging Techniques).

MS-20~SHOULDER

- **MS-20.1 See Disease/Injury Categories (MS-4 through MS-19)**
  o Studies can be approved if applicable to the shoulder.
  o Also see section on Fracture of the Clavicle in MS-5.1 Acute under Fractures and Dislocation

- **MS-20.2 Shoulder Pain**
  o A thorough history, recent physical exam, and plain x-rays should be performed initially.
  o “When imaging studies are indicated during the initial evaluation and treatment of a patient with shoulder pain, appropriate plain x-rays should be obtained. More sophisticated imaging studies (such as shoulder MRI, ultrasound, or arthrography) are not indicated.”*
  o Reference:

- **MS-20.3 Impingement**
  o Definition: Pressure-induced tendonitis of the rotator cuff (chiefly the supraspinatus) caused by the acromion process during shoulder abduction.
  o Diagnosis is generally by history and physical exam with the “impingement sign” (abduction and internal rotation of the shoulder) being positive.
  o Plain x-rays should be performed initially.
  o Suspected impingement should be managed with a conservative program which might include NSAIDS, physical therapy or a physician-directed home exercise program, steroid dosepack, and/or steroid injection for 6 to 8 weeks prior to considering advanced imaging.1,2,3,4
    o Orthopedic consultation is helpful in determining when to proceed with imaging.5
  o Variants of the acromion process such as down-turned acromion, can contribute to impingement syndrome and should be evaluated using plain x-rays initially.
    - Noncontrast MRI of the shoulder (CPT®73221) can be performed to identify these variants if surgery is being considered.
      1 Am Fam Physician 1998 Feb;57(4):667-674
      3 Am Fam Physician 2000 June;61(11):3291-3300
### MS-20.4 Tendonitis

- **Definition:** Inflammation of tendons, generally the rotator cuff (subscapularis, supraspinatus, and infraspinatus), but also of the tendon of the long head of the biceps which traverses the shoulder joint.
- A thorough history, recent physical exam, and plain x-rays should be performed initially.
- As with impingement, tendonitis should be managed conservatively which might include NSAIDS, physical therapy or a physician-directed home exercise program, steroid dosepack, and/or steroid injection for 6 to 8 weeks prior to considering advanced imaging.\(^1\), \(^2\), \(^3\), \(^4\)
- Although tendonitis can be diagnosed by noncontrast MRI, MRI is rarely indicated except to rule out other more serious problems.
- Noncontrast MRI (CPT® 73221) should be approved only after a protracted (at least 6 to 8 weeks) trial of conservative measures has failed or the physician expresses concern for malignancy.

### MS-20.5 Tendon (Biceps Long Head) Rupture

- Common shoulder injury which can also occur spontaneously.
- Usually diagnosed clinically.
- A thorough history, recent physical exam, and plain x-rays should be performed initially.
- Diagnosis can be difficult in obese patients.
  - Noncontrast MRI (CPT® 73218) can be performed in obese patients with suspected biceps long head rupture.
- Conservative treatment is performed in the vast majority of patients since the biceps has two tendons of origin and remains quite functional.*
  - MRI rarely affects treatment.
- Surgical repair is more likely to be performed in patients under age 35.

### MS-20.6 Rotator Cuff Tear

- The rotator cuff is composed of four musculotendinous units: subscapularis (anteriorly), supraspinatus (superiorly), and the infraspinatus and teres minor (posteriorly) which function to assist in rotating and stabilizing the humeral head.
A thorough history, recent physical exam, and plain x-rays should be performed initially.

Other muscles such as the deltoid and pectoralis major can also affect shoulder rotation, so there is no good clinical test to evaluate rotator cuff function.

Pain on abduction, a positive drop test, and limited shoulder rotation are not reliable signs of rotator cuff tear and can be positive in other pain-producing shoulder conditions.

Rotator cuff tear is not a surgical emergency and in most cases, suspected rotator cuff tear should be treated conservatively for 4 to 6 weeks\(^1\) which might include NSAIDS, physical therapy or a physician-directed home exercise program, steroid dosepack, and/or steroid injection prior to considering advanced imaging

- This is particularly true in the older patient with impingement.\(^2\)
- The exception is the acute injury in the patient under age 40.
  - Surgical repair should be done in these patients within 3 weeks, and noncontrast shoulder MRI (CPT\(^{\circledast}73221\)) is appropriate.\(^3\)

Noncontrast shoulder MRI (CPT\(^{\circledast}73221\)) is the study of choice for the chronic rotator cuff tear, but should be reserved as a preoperative study for patients who have failed conservative therapy.

Orthopedic consultation is useful in determining the need for imaging and operative treatment.

**MS-20.7 Dislocation/Subluxation/Labral Tear**

- The glenoid (shoulder socket) labrum is a fibrocartilagenous ring/rim that deepens the glenoid cavity.
- The labrum is torn in acute twisting injuries of the shoulder joint that also can cause dislocation. Chronic tears occur in throwing athletes.
- Symptoms/signs can be pain, a popping or clicking with shoulder motion, and a positive apprehension sign (anxiety and pain with shoulder abduction and external rotation).
- Labral tear, if symptomatic, is generally treated surgically and Orthopedic input is helpful.
- A thorough history, recent physical exam, and plain x-rays should be performed initially.
- Shoulder MRI with contrast (MR arthrogram CPT\(^{\circledast}73222\)) is the appropriate study and can be approved when labral tear is suspected\(^1\) as documented on an appropriate physical examination.
- Frank shoulder dislocation is reduced emergently in the Emergency Department/office and should be imaged by plain x-ray including axillary view if necessary.\(^2\)

\(^1\)\textit{Am Fam Physician} 2000 June;61(11):3291-3300

\(^2\)\textit{Am Fam Physician} 1998 Feb;57(4):667-674

\(^3\)\textit{Am Fam Physician} 2000 June;61(11):3291-3300
Advanced imaging in patients with shoulder dislocation is rarely needed. **Exception:** noncontrast shoulder CT (CPT®73200) to evaluate large Hill-Sachs lesions (impaction/indentation fractures of the humeral head caused by the edge of the glenoid in a dislocation) can be performed prior to surgery.

Some subtle dislocations/subluxations (e.g. posterior dislocations) are difficult to see on plain x-ray. 
- Noncontrast shoulder CT (CPT®73200) can be performed if the treating physician suspects this condition.

### MS-20.8 Frozen Shoulder/Adhesive Capsulitis

- **Definition:** condition of extremely limited shoulder motion caused by adhesions (fibrous bands) within the joint and a thickened contracted capsule.
- This condition is often precipitated by shoulder injury/disease.
- The diagnosis is made clinically.
- A thorough history, recent physical exam, and plain x-rays should be performed initially.
- Treatment is conservative and might include NSAIDS, steroid injection, and physical therapy or a physician-directed home exercise program.
- Shoulder manipulation under anesthesia can be performed for the unresponsive cases.

**References:**
- American Academy of Orthopedic Surgeons- Shoulder Pain Guideline 2001

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

### MS-20.9 Osteoarthritis

- A thorough history, recent physical exam, and plain x-rays should be performed initially.
- Treatment is generally conservative and might include NSAIDS, heat, range of motion exercises, and steroid injection.

**References:**
- American Academy of Orthopaedic Surgeons- Shoulder Pain Guideline 2001
o Advanced imaging is rarely needed in osteoarthritis.
  ➢ **Exception:** noncontrast shoulder CT or MRI (CPT®73200 or CPT®73221) as ordered by the operating surgeon for preoperative planning.

- **MS-20.10 Acromioclavicular (AC) Separation**
  o Plain x-rays should be performed initially to rule out fracture.
  o If an unstable AC joint injury is suspected but not confirmed on routine AP and lateral views on plain x-ray, stress views are indicated.*
  o MRI is not ordered routinely in the management of straightforward AC disruptions. Detailed knowledge of AC and coracoclavicular ligamentous injury is not needed for conservative or surgical care.
    ➢ In middle-aged and older patients who continue to have disabling shoulder pain after the acute pain of an AC disruption abates, MRI may be indicated to evaluate for possible rotator cuff tear.*
  o Treatment is conservative initially with surgery being reserved for grade III separations that fail conservative therapy.*

- **MS-20.11 Sternoclavicular (SC) Dislocation**
  o Anterior dislocation is more common than posterior dislocation and is more easily diagnosed. Treatment is usually non-operative.
  o Posterior dislocation is more serious and should be treated as a medical emergency due to possible complications to major vascular structures and trachea.
  o A thorough history, recent physical exam, and plain x-rays should be performed initially. However, plain x-rays may be difficult to interpret.
  o CT chest without contrast (CPT®71250) is the most reliable study to determine subluxation and is indicated in the setting of suspected sternoclavicular subluxation/dislocation.
  o **Reference:**

- **MS-20.12 Post-Operative Shoulder**
  o Diagnosing the etiology of pain or other symptoms after shoulder surgery can be a difficult diagnostic problem.
  o Knowledge of the complications of the specific orthopedic procedure performed and of the usual post-operative course of that procedure is important.
  o A thorough history, recent physical exam, and plain x-rays should be performed initially.
  o The imaging choices in evaluating symptomatic post-operative patients are complicated.*
Orthopedic evaluation is extremely helpful in determining the appropriate imaging pathway and to interpret the significance of imaging findings in the postoperative setting.

- Painful total joint prosthesis
  - See MS-19 Total Joint Prosthesis.

### MS-21~ELBOW

- See Disease/Injury Categories (MS-4 through MS-19)
  - Studies can be approved if applicable to the elbow.

#### Epicondylitis /Tendonitis (Tennis Elbow)
- Diagnosis is made clinically.
- Treatment is conservative and might include NSAIDS, steroid injection, steroid dosepack, and physical therapy for 8-12 weeks.\(^1\)
- Specialty referral is beneficial for failures of conservative therapy.\(^1\)
- Surgery is reserved for conservative treatment failures.\(^2\)

\(^1\) *Am Fam Physician 2007 Sept;76(6):843-848*

- Advanced imaging should rarely be needed.

#### Ruptured Biceps Insertion (at elbow)
- Complete rupture can often be diagnosed clinically by palpation, but patients will still have active elbow flexion with complete rupture due to the brachialis muscle.
- Often treated operatively, and noncontrast elbow MRI (CPT® 73221) is appropriate if requested.*

* *Greene WB (Ed.). *Essentials of Musculoskeletal Care. 2nd Ed. Rosemont,IL, American Academy of Orthopaedic Surgeons, 2001, pp.195-196*

#### Trauma
- Plain x-rays should be performed initially.
  - If plain x-rays are positive for fracture, no further imaging is generally necessary.
  - If plain x-rays show joint effusion (posterior fat pad sign), MRI often shows an occult fracture but does not affect treatment decisions. Neither MRI nor CT is indicated in the evaluation and treatment of a patient with a positive fat pad sign.
- CT without contrast (CPT® 73200) or occasionally MRI without contrast (CPT® 73221) can be performed for preoperative planning when ordered by the operating surgeon.

#### References:
- *ACR Appropriateness Criteria, Chronic elbow pain, 2008*
- *AJR 2001;176:53-60*
• See Disease/Injury Categories (MS-4 through MS-19)
  o Studies can be approved as above if applicable to the wrist.

• Rheumatoid Arthritis
  o See MS-17 Rheumatoid Arthritis and Inflammatory Arthritis

• Carpal Tunnel Syndrome
  o Also see SP-11.5 Cervical Radiculopathy, Differential diagnosis in the Spine Imaging Guidelines and PN-2.1 Carpal Tunnel Syndrome in the Peripheral Nerve Disorders Imaging Guidelines.
  o Diagnosis is made clinically and with NCV/EMG.
  o Imaging studies are rarely indicated.
  o MRI can show wrist anatomy but has not been shown to be useful in diagnosing carpal tunnel.*
    ➢ However, if a mass is being considered as the etiology, noncontrast wrist MRI (CPT®73221) can be performed preoperatively.

• Ligament Injuries
  o Plain x-rays should be performed initially.
  o Imaging procedures are appropriate for wrist pain/sprain that has been treated for 6 weeks with little or no improvement.
    ➢ Repeat x-rays with scaphoid views are indicated.
    ➢ Additionally, arthrogram may be of value to evaluate carpal ligament tears, but should only be done after consultation with an orthopedic surgeon.*
  o Since ligament injuries of the wrist are generally difficult to diagnose, a noncontrast wrist MRI (CPT®73221) can be performed after the trial of conservative therapy or if there are equivocal findings on plain x-ray.
  o Surgery is indicated for most complete ligament injuries;* therefore the request will often be from an orthopedic or hand surgeon and their input is helpful prior to advanced imaging.
**MS-23~HAND**

- See Disease/Injury Categories (MS-4 through MS-19)
  - Studies can be approved as above if applicable to the hand
- A thorough history, recent physical exam, and plain x-rays should be performed initially.
  - If plain x-rays are positive for fracture, no further imaging is generally indicated except in complex joint fractures where noncontrast CT (CPT® 73200) is helpful.
  - If plain x-rays are negative or equivocal, conservative treatment/splinting followed by re-evaluation and repeat x-ray in 10 to 14 days is indicated.
- Orthopedic specialist, Hand surgeon, or Plastic surgery evaluation is helpful in determining the appropriate imaging pathway.
- Ganglion cyst
  - See [MS-7 Ganglion Cysts](#)

**MS-24~PELVIS**

- See Disease/Injury Categories (MS-4 through MS-19)
  - Studies can be approved as above if applicable to the pelvis.
- **Complex Fracture**
  - A thorough history, recent physical exam, and plain x-rays should be performed initially.
  - Orthopedic evaluation is helpful in determining the need for advanced imaging.
  - Pelvic CT without contrast (CPT® 72192) can be performed to evaluate complex pelvic ring/acetabular fractures.*
- **Sacro-iliac Joints (SI Joints)**
  - Also see SP-6 Sacroiliac (SI) Joint Pain and Coccydynia in the Spine Imaging Guidelines.
  - A thorough history, recent physical exam, and plain x-rays should be performed initially.
  - Rheumatology evaluation is helpful in assessing the need for advanced imaging.
- **Chronic Pelvic Pain**
  - See PV-10 Pelvic Pain/Dyspareunia, Female and,
  - PV-19 Prostatitis/Hematospermia/Chronic Pelvic Pain in the Pelvis Imaging Guidelines
• **MS-25.1** See Disease/Injury Categories (MS-4 through MS-19)
  o Studies can be approved as above if applicable to the hip.

• **MS-25.2** Hip Pain
  o A thorough history, recent physical exam, and plain x-rays should be performed initially.
  o True hip pain is almost always anterior and often accompanied by a painful and/or limited range of motion of the hip.
    ➢ With rare exception, any pain located posterior to the greater trochanter is spine or nerve related.
  o Plain films should be done initially.¹
    ➢ “In the typical patient presenting with hip pain, there have been no studies to indicate that MRI should be used routinely to detect occult AVN. Because of the large number of patients who have bursitis or osteoarthritis, it would not be cost effective to obtain an MRI on every patient presenting with hip pain.” ²
  ¹ ACR Appropriateness Criteria, Chronic hip pain, 2008
  ² ACR Appropriateness Criteria, Avascular necrosis of the hip, 2009
  ➢ If plain x-rays are negative, a 6 to 8 week trial of conservative therapy which might include NSAIDS, physician supervised exercise program, steroid dosepack, and/or steroid injection is warranted prior to considering advanced imaging.
  o Hip pathology as the cause of hip pain can be evaluated by examination of hip range of motion (particularly rotation), which will be limited and/or painful in patients with hip disease.*
  o Hip pain is frequently a feature of vertebral disc disease.
    ➢ The presence of hip pain in the setting of low back pain is not in and of itself an indication for hip imaging in addition to spine imaging, unless there is limited and/or painful range of hip motion on exam.
  o Degenerative disc disease can cause hip pain (usually posteriorly).
    ➢ These patients do not have anterior thigh pain and do not have pain and/or limited motion on hip range of motion exam.
    ➢ Advanced hip imaging is not indicated in this situation.*
  o Orthopedic specialist evaluation is helpful in determining the appropriate imaging pathway.

• **MS-25.3** Suspected Occult Hip Fracture
  o A thorough history, recent physical exam, and plain x-rays should be performed initially.
If plain x-ray is negative for fracture, but occult hip fracture is suspected, noncontrast hip CT (CPT®73700) or hip MRI (CPT®73721) depending on physician preference, can be performed.

- **MS-25.4 Osteoarthritis**
  - The diagnosis is based on history and physical exam and confirmed by x-ray.*
    - X-ray also helps to rule out other significant causes of hip pain such as AVN and tumor.
  - Brigham and Women's Hospital. http://www.brighamandwomens.org
  - Accessed November 28, 2006
  - Treatment is conservative and might include weight reduction if necessary, acetaminophen, NSAIDS, exercise, intraarticular steroid injection, and in severe cases, joint replacement.¹,²
  - Advanced imaging is rarely needed in osteoarthritis. ¹,²,³
    - Exception: noncontrast hip CT (CPT®73700) or MRI (CPT®73721) as requested by the operating surgeon for preoperative planning in patients undergoing total hip replacement.
  - Referral to an orthopedic surgeon should be considered in patients who fail medical management.⁴

¹ Am Fam Physician 2000 March;61(6):1795-1804
² Greene WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed.
  Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, pp. 320-321
  Accessed October 1, 2007
⁴ Arthritis & Rheumatism 2000 Sept;43(9):1905-1915

- **MS-25.5 Avascular Necrosis (AVN)**
  - Also see MS-4 Avascular Necrosis (AVN)
  - Occurs when the femoral head loses its blood supply.
  - Common causes include femoral neck fracture, cortisone therapy (usually long term), alcoholism, collagen disease, sickle cell disease, and gout.
  - Less common causes include deep sea diving and Gaucher’s disease.
  - Avascular necrosis is termed “idiopathic” when none of the above etiologies is present.
  - Pain is generally severe and there is significant pain with hip motion.
  - Plain x-rays should be done initially in all cases. If positive, no further imaging is necessary since treatment is symptomatic only until total hip replacement becomes necessary for severe cases.*
  - *Major N. Pitfalls in Musculoskeletal Imaging—the Hip.
  - Presented at: 33rd Annual Radiology Refresher Course of the International Skeletal Society,
  - September 13-16, 2006; Vancouver, British Columbia, Canada
  - Noncontrast hip MRI (CPT®73721) if unilateral imaging is requested, or noncontrast MRI pelvis (CPT®72195) if bilateral hip imaging is requested, is
the modality of choice to evaluate suspected AVN with negative or equivocal x-rays."

*ACR Appropriateness Criteria, Chronic hip pain, 2008

- Treatment is symptomatic (NSAIDS and partial weight bearing) in mild cases, but often total hip replacement is necessary.

- **MS-25.6 Labral Tear**
  - The acetabular (hip socket) labrum is similar to the glenoid labrum, but is less frequently torn. Often, no history of trauma can be elicited.
  - Symptoms include hip pain and mechanical signs such as clicking/popping and painful catching.
  - MRI with contrast (MR arthrogram CPT®73722) is the appropriate imaging study."

  *Radiographics 2002;22:1223-1246

- **MS-25.7 Impingement**
  - There are two types of femoral/acetabular impingement:
    - **cam type**: caused by the loss of the normal “waist” (indentation) at the head/neck junction (usually superior) causing incongruity with abduction.
    - **pincer type**: caused by an overcoverage/protrusion of the acetabulum causing incongruity with motion.
  - The diagnosis in both types is by plain x-ray.
  - Hip MRI without contrast (CPT®73721) can be approved as a preoperative study primarily to rule out labral tear, which is common in impingement.

- **MS-25.8 Piriformis Syndrome**
  - Also see PN-2.4 Sciatic Neuropathy in the Peripheral Nerve Disorders Imaging Guidelines
  - Piriformis Syndrome is characterized by buttock, thigh, and sometimes calf pain due to entrapment of the sciatic nerve at the sciatic notch in the pelvis by a tight piriformis muscle band.
  - Pain is often exacerbated with prolonged sitting.
  - On physical examination, there is tenderness in the sciatic notch and pain with flexion, adduction, and internal rotation of the hip (FAIR test).*
  - Imaging is rarely helpful, but EMG/NCV should confirm the diagnosis.*

  - A thorough history, recent physical exam, and plain x-rays should be performed initially.
  - Evaluation by a Neurology, Orthopedic, or Pain Management specialist is helpful in determining the need for advanced imaging.
    - MRI pelvis without contrast (CPT®72195) or CT pelvis without contrast (CPT®72192) can be approved as a preoperative study or to evaluate severe cases.

- **MS-25.9 Painful Total Joint Prosthesis**
  - See MS-19 Total Joint Prosthesis
• **MS-26.1 See Disease/Injury Categories (MS-4 through MS-19)**
  o Studies can be approved as above if applicable to the knee.

• **MS-26.2 General (History, Physical Exam, Mechanism of Injury)**
  o A recent careful history, physical examination, and plain x-rays should be performed prior to considering advanced imaging.
  o **History of mechanism of injury** is very important.
    - Most meniscal and ligament tears are sustained due to twisting type injuries.
    - Meniscal tears can also be caused by squatting—particularly in the degenerated meniscus.
  o **Physical exam** is very important.
    - Almost all significant acute meniscal injuries will be associated with swelling.
    - **Signs of ligamentous disruption:**
      - Valgus (medial) instability
      - Varus (lateral) instability
      - Anterior drawer (pulling tibia forward with knee flexed 90 degrees)
      - Posterior drawer (pushing tibia backward with the knee flexed 90 degrees)
      - **Lachman** (modified anterior drawer with knee at 20 degrees of flexion).
    - **McMurray’s test** (rotating the foot while flexing/extending the knee).
      - When positive (a deep clunk or shift, not a snap or click), McMurray’s test is **strong evidence** of a meniscal tear.
    - **Crepitus** is usually caused by chondromalacia (softening of the articular cartilage) which causes a momentary catch or failure of the joint surfaces to slide smoothly. Usually generates a high pitched sound—snap or crackle (as opposed to McMurray’s which is low pitched).
    - Particular attention to knee extension is important, as displaced meniscal tears and other causes of internal derangement, (e.g. loose body, etc.) will often cause a limitation of full extension-- the so called “locked knee.”
    - **Soft signs/symptoms of meniscal tear include:**
      - Giving way (which can also be due to pain or weakness).
      - Joint line tenderness.
      - Inability to bear weight.
    - **Swelling/Effusion:** see **MS-26.12 Knee Swelling/Effusion**

• **MS-26.3 Knee Pain**
  o Plain x-rays should be performed initially if there is severe pain, or after 1 to 4 weeks of treatment with analgesics/NSAID’s prior to considering advanced imaging if pain is not severe.
  o If plain x-rays are negative, the knee is stable and extends fully, and there is no evidence of internal derangement on physical exam, a 6 to 8 week period of conservative care, which might include NSAIDS, physical therapy or a
physician-supervised exercise program, steroid dosepack, and/or steroid injection is appropriate prior to considering advanced imaging.

- If x-rays are negative, specialist evaluation is helpful.²
  - If x-rays show arthritis, further treatment with analgesics/NSAIDS, patient education, walking aids, and physical therapy should be performed prior to considering advanced imaging.²

1. ACR Appropriateness Criteria, Nontraumatic knee pain, 2008

### MS-26.4 Meniscus Tear

- Plain x-rays should be performed initially¹,² to rule out other problems such as osteochondral fractures or joint mice (loose bodies) that can mimic meniscal tear.
  
  - If these are present, Orthopedic evaluation is helpful to determine further treatment and need for advanced imaging.

- If plain x-rays are negative, the knee is stable and extends fully, and McMurray’s test is negative, a 6 to 8 week period of conservative care,³ which might include NSAIDS and a physician-supervised exercise program including aggressive quadriceps strengthening exercises is appropriate prior to considering advanced imaging.

- If conservative therapy fails, Orthopedic evaluation is helpful in deciding the need for further advanced imaging and treatment.³

- Knee MRI without contrast (CPT® 73721) is the study of choice when advanced imaging is indicated.

1. ACR Appropriateness Criteria, Nontraumatic knee pain, 2008
3. New Zealand Guidelines Group, The Diagnosis and Management of Soft Tissue Knee Injuries Updated 2008

### MS-26.5 Ligament Tear

- A thorough history, recent physical exam, and plain x-rays should be performed initially

- Complete ligament tears are usually diagnosed clinically; however, the exam can be quite difficult in a large person who has pain and guarding. This is not an indication for immediate advanced imaging, since surgical repair of a torn knee ligament is rarely an emergent procedure.

- If physical exam indicates a torn ligament (e.g. positive anterior drawer, posterior drawer, Lachman, medial (valgus) or lateral (varus) stress test), then noncontrast knee MRI (CPT® 73721) can be performed.
  
  - Orthopedic consultation is helpful in delineating further treatment and/or need for advanced imaging.¹

- If the physical exam is negative or equivocal, a period of conservative therapy, including brief splinting with protected weight bearing followed by aggressive physical therapy for at least four weeks, is indicated prior to advanced imaging.¹
Noncontrast knee MRI (CPT® 73721) is the study of choice if conservative therapy fails.²

1American Academy of Orthopedic Surgeons Knee Injury Guideline 2001
2ACR Appropriateness Criteria, Nontraumatic knee pain, 2008

• MS-26.6 Osteoarthritis
  o A thorough history, recent physical exam, and plain x-rays should be performed initially
  o Advanced imaging is not recommended in known arthritis of the knee.¹
    ➢ Exception:
    ▪ If signs of internal derangement are present or there is concern for malignancy, noncontrast knee MRI (CPT® 73721) can be performed.
    ▪ Noncontrast knee MRI (CPT® 73721) can be approved for patients being considered for unicompartamental knee replacement (medial or lateral) if plain x-rays do not show significant arthritis in the other side of the joint.
  o Referral to an orthopedic surgeon should be considered in patients who fail medical management.²
    ➢ Noncontrast knee CT (CPT® 73700) with 3-D rendering (CPT® 76377) can be approved for preoperative planning of total knee replacement if requested by the operating surgeon.³

2Arthritis & Rheumatism 2000 Sept;43(9):1905-1915
3AJR 2006 June;186(6):1778-1782

• MS-26.7 Patellar Dislocation/Subluxation
  o Dislocation/subluxation of the patella is largely a clinical diagnosis.
  o Plain x-rays should be performed initially to rule out resulting osteochondral fractures.
  o Treatment is conservative and might include splinting followed by aggressive quadriceps exercises.
  o Most patients respond to this regimen, but if continued dislocation/subluxation occurs, surgery (lateral release or formal extensor realignment) may be indicated.¹
    ➢ Some studies have suggested that most common surgical procedures for patellar tracking problems can result in medial displacement of the patella.²
  o Currently, some centers (mainly academic) are doing dynamic MRI and CT imaging for assessment of patellar tracking, which is abnormal in patellar subluxation.
    ➢ Insufficient information is available at this time to routinely approve these studies and requests should be sent for Medical Director review.

• **MS-26.8 Chondromalacia Patella**
  o Degeneration of hyaline cartilage on the articular surface of the patella, femur or tibia.
  o Diagnosis is made clinically based upon the patient’s symptoms and clinical examination of the knee.
  o Plain x-rays are helpful in demonstrating anatomic variations associated with chondromalacia.*
  o MRI does show abnormalities of the joint surface cartilage, but is rarely necessary for diagnosis.
  o The role of MRI in this condition is currently being investigated.*
    ➢ Also see [MS-26.7 Patellar Dislocation/Subluxation](#)

*Chondromalacia Patella, Patellofemoral Syndrome.*
Accessed October 1, 2007

  o Treatment is conservative and might include anti-inflammatory medication and exercises to strengthen the quadriceps.

• **MS-26.9 Baker’s Cyst**
  o See also PVD-7.3 Lower Extremity Edema in the Peripheral Vascular Disease Imaging Guidelines
  o **Definition:** Cyst posterior to the knee which is almost always associated, in adults, with intra-articular knee pathology.
  o Ultrasound is the indicated initial imaging study.¹
  o It is generally accepted that Baker’s cysts in adults are not amenable to surgical excision because they will almost always recur.²
  o Noncontrast knee MRI (CPT®73721) is only indicated if surgical excision is being considered.

  ¹*University of Michigan Health System Knee Pain Guideline- 2005*

• **MS-26.10 Post-Operative Knee**
  o Diagnosing the etiology of pain or other symptoms after knee surgery can be a difficult diagnostic problem.
  o Knowledge of the complications of the specific orthopedic procedure performed and of the usual post-operative course of that procedure is important.
  o A thorough history, recent physical exam, and plain x-rays should be performed initially.
  o The imaging choices in evaluating symptomatic post-operative patients are complicated.*

*Radiology 2003;229:159*

  o Orthopedic evaluation is extremely helpful in determining the appropriate imaging pathway and to interpret the significance of imaging findings in the postoperative setting.
  o **Painful total joint prosthesis**
• See **MS-19 Total Joint Prosthesis**

- **MS-26.11 Plica (Symptomatic Synovial Plica/Medical Synovial Shelf)**
  - Symptomatic Synovial Plica is a clinical diagnosis with symptoms of anterior knee pain, a painful snap or pop with knee flexion, and a palpable and tender cord (usually medially but occasionally laterally or above the patella).\(^1,2\)
  - A thorough history, recent physical exam, and plain x-rays should be performed initially.
  - MRI is of limited value in the diagnosis.\(^2\)


• **MS-26.12 Knee Swelling/Effusion**
  - Effusion is a very nonspecific finding which occurs in many knee conditions
    - Can be a sign of inflammation in the knee which has many causes (arthritis, crystalline deposit diseases, loose body, degenerative meniscal disease, etc.).
    - Can be due to blood in the knee from an acute fracture or ligament tear.
    - Chondromalacia is a frequent cause of ongoing knee effusion.
  - Effusion is not in and of itself an indication for advanced imaging.
  - If knee effusion is the only sign/symptom:
    - Plain x-ray is performed initially to evaluate for arthritis or other bony pathology
    - Ultrasound may help detect joint effusion and synovial hypertrophy
    - Trial of conservative therapy which might include NSAIDS, steroid burst, intra-articular steroid injection, and exercises should be completed prior to considering advanced imaging.
    - If conservative therapy fails, knee aspiration with examination of the knee fluid to rule out crystalline deposition diseases should be performed prior to considering advanced imaging.

- **Reference:**
  - *Ann Rheum Dis* 2010;69:12-19
**MS-27~LEG LENGTH DISCREPANCY**

- Prediction of ultimate limb length discrepancy is an inexact science.
  - A small limb length discrepancy (e.g., 1.5 cm) has no known deleterious effects.
  - The goal in epiphysiodesis, when done, should be near and not necessarily perfect limb length equality.*
- Plain radiographic or CT scanogram remains the gold standard for leg length measurement.* Such measurement procedures are reported with CPT® 77073, regardless of the modality used, including “CT scanograms”.
- Advanced imaging other than CT scanogram is generally not indicated.

**MS-28~LEG PAIN/CALF TENDERNESS**

- Causes of leg pain are multiple and can include trauma, vascular disease, overuse syndromes (stress fracture, shin splints, and chronic compartment syndrome), tumors, infections, peripheral nerve disorders, spine disease, etc.
- A thorough history and physical exam should be performed initially, including information regarding edema, skin changes, specific areas of tenderness, pulses, and full neurological exam.
- Diagnostic studies such as plain x-ray, ultrasound, venous and/or arterial Doppler, ankle/brachial index, compartment pressure, and NCV/EMG should be considered initially and can help determine the need for advanced imaging.
- For most medical causes of leg pain, advanced imaging with CT or MRI is generally not helpful in making a diagnosis.
- **Reference:**
- **Stress Fracture of the Tibia**
  - Common in running athletes
  - Characterized by pain in the tibia aggravated by activity and tenderness at the site of the stress fracture which extends across the entire width of the bone, not just the medial border as is common in shin splints.
    - Often pain will be elicited when valgus, or varus (medial or lateral) stress is placed on the tibia during examination
  - Plain x-rays should be done as the initial imaging study and may show the fracture and/or fracture calus (healing) if the fracture has been present for several weeks.
    - Sometimes the fracture never becomes evident on plain x-ray
  - If stress fracture of the tibia is suspected, MRI of the tibia without contrast (CPT® 73718) can be performed.
  - CT of the tibia without contrast (CPT® 73700) can be performed for the following:
    - There is a contraindication to MRI, or
➢ There is a concern for non-union of the stress fracture

○ References:
  ➢ ACR Appropriateness Criteria, Stress/insufficiency fracture, 2008
  ➢ Greene WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed.
    Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, p.356,
    508

• Shin Splints
  o Periosteal inflammation of the medial crest of the tibia at the origin of the
    posterior tibial, soleus, or flexor digitorum longus muscles.
    ➢ Caused by traction
    ➢ Characterized by tenderness of the medial crest of the tibia in the
      area of the mid shaft, and pain in this area with running/walking,
      and dorsiflexion and eversion of the foot.
  o Diagnosis is made clinically based upon the above findings.
  o A thorough history, recent physical exam, and plain x-rays should be
    performed initially.
  o Advanced imaging is not generally indicated.
    ➢ MRI of the lower leg without contrast (CPT® 73718) can be
      considered if there is no improvement in symptoms after a 4
      week trial of conservative treatment (including cessation of the
      initiating activity and NSAIDS) if the diagnosis remains
      uncertain, in order to rule out stress fracture of the tibia.
      ▪ These requests should be sent for Medical Director
        review
  o Reference:
    ➢ Shiel WC. Shin Splints. MedicineNet.com, February 29, 2008,
      16, 2009

• Chronic Exertional Compartment Syndrome
  o Occurs most commonly in the lower leg, although can occur anywhere
    ➢ Lower leg: any of the four compartments can be involved, but most
      commonly involves the anterior compartment just lateral to the
      subcutaneous border of the tibia
  o Characterized by pain with exertion in the involved muscles that resolves
    with rest
  o A thorough history, recent physical exam, and plain x-rays should be
    performed initially.
  o “Compartment pressure readings with and without exercise are the gold
    standard for the diagnosis of chronic exertional compartment syndrome”*
    *Rowdon GA and Abdelkarim B. Compartment syndromes: Differential diagnoses
      & workup. eMedicine, October 29, 2008.
      18, 2009
MS-29~ANKLE

- MS-29.1 See Disease/Injury Categories (MS-4 through MS-19)
  o Studies can be approved as above if applicable to the ankle.

- MS-29.2 One Study/Area Only
  o In foot and ankle imaging, studies are frequently ordered of both areas. This is unnecessary since ankle MRI will image from above the ankle to the mid-metatarsal area. **Only one CPT® code should be reported.**

- MS-29.3 Sprain (including Avulsion Fracture)
  o Plain x-rays should be performed initially to rule out fracture.\(^1\)
  o If plain x-rays are negative, a 6 to 8 week trial of conservative therapy is warranted prior to considering advanced imaging.\(^2\)
  o If conservative therapy fails, ankle MRI without contrast (CPT®73721) can diagnose pathology, including osteochondral fracture of the talar dome, occult fracture, peroneal tendon rupture and “high ankle sprain,” and is the study of choice.\(^1,2\)
  o Alternatively, ankle CT without contrast (CPT®73700) can be approved, especially if requested by the Orthopedic or Podiatry specialist.
  o **High ankle sprain** refers to injury to the ligaments of the tibiofibular syndesmosis (the ligaments that attach the distal ends of the tibia and fibula to each other).
    - Examination reveals tenderness and swelling in the syndesmosis, positive squeeze test (squeezing the tibia and fibula together at mid calf), and external rotation (of the foot) test.
    - Treatment is conservative and might include RICE, partial weight bearing and range of motion exercises).\(^2,3\)

\(^1\) ACR Appropriateness Criteria, Chronic ankle pain, 2009
\(^2\) Am Fam Physician 2001 Jan;63(1):93-104
\(^3\) Greene WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed. Rosemont,IL, American Academy of Orthopaedic Surgeons, 2001, pp.422-424

- MS-29.4 Impingement
  o Impingement can be anterior. Diagnosis is by plain x-ray with the ankle in maximum dorsiflexion. It is a bony impingement characterized by anterior tibial and talar neck spurs.
  o In anterior-lateral impingement, which often occurs after sprains, a scar tissue mass in the area of the anterior talofibular ligament (one of the three lateral ankle ligaments) is usually the cause of the impingement.\(^1\)
    - If anterior-lateral impingement is suspected, MR or CT arthrography (CPT®73722 or CPT®73701) can be performed.\(^2\)
  o Posterior impingement often involves an os trigonum (accessory foot bone). Ankle MRI without contrast (CPT®73721) can be performed.

\(^1\) Greene WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed. Rosemont,IL, American Academy of Orthopaedic Surgeons, 2001, p.435
\(^2\) ACR Appropriateness Criteria, Chronic ankle pain, 2009
• **MS-29.5 Tendonitis**
  o Plain x-rays should be performed initially to rule out entities such as calcific tendinitis/bursitis.*
    *Am Fam Physician 1998 Feb;57(4):667-674*
  o A trial of at least 6 to 8 weeks of conservative therapy which might include NSAIDS/cortisone dosepack, and physical therapy or a physician-directed home exercise program is warranted prior to considering advanced imaging.
  o MRI ankle without contrast (CPT®73721) is the appropriate study if advanced imaging is indicated.
  o Orthopedic evaluation is helpful in determining the need for advanced imaging.

• **MS-29.6 Ruptured Achilles Tendon (Partial/Complete)**
  o **Complete rupture of the Achilles tendon**
    ➢ Complete rupture is most often a clinical diagnosis.
    ➢ Patients present with swelling, point tenderness, and often a palpable defect.
    ➢ Not all plantar flexion is lost because of the intact toe flexors, but the Thompson’s test is positive for rupture.
      ▪ Thompson’s test is done by having the patient kneel in a chair then squeezing the calf muscle. If the Achilles is ruptured, the foot will not plantar flex.*
      ▪ In complete rupture of the Achilles’ tendon, surgery is often the treatment and prompt referral to Orthopedics is helpful if surgery is being considered.*
    ➢ However, a recent study**comparing the efficacy of conservative treatment with cast/splint to surgical repair, found conservative treatment to be equal to surgery.
      *Lower Extremity Musculoskeletal Disorders- A Guide to Diagnosis and Treatment. 2003 Brigham and Women’s Hospital.
    ➢ Advanced imaging is rarely indicated as a preoperative test.
    ➢ MRI without contrast (CPT® 73721) can be approved if requested by the operating surgeon.
  o **Partial rupture of the Achilles tendon**
    ➢ Orthopedic/podiatry evaluation is helpful in differentiating partial Achilles tendon rupture from plantaris tendon or gastrocnemius muscle rupture.
    ➢ Chronic partial tendon ruptures are characterized by intermittent soreness and often by a knot/mass palpable or visible in the tendon.
    ➢ Imaging is usually not necessary unless surgery is planned.
  o **References:**
    ➢ Lower Extremity Musculoskeletal Disorders-A Guide to Diagnosis and Treatment. 2003 Brigham and Women’s Hospital.
**MS-29.7 Lateral Instability**
- Chronic lateral instability can occur after single or multiple ankle sprains. It is manifested by recurrent ankle sprains sometimes with minimal trauma.
- "This is a dynamic problem which is not generally amenable to identifying with a static test."\(^1\)
- Plain stress x-rays of both ankles can be used to make the diagnosis.
- Conservative treatment is generally done first with physical therapy.\(^2\)
- A lateral heel/sole wedge may be prescribed.
- A thorough history, recent physical exam, and plain x-rays should be performed initially.
- Ankle MRI without contrast (CPT®73721) or MR arthrography (CPT®73722)\(^3\) can be performed if surgery to reconstruct the lateral ankle ligament complex is planned.

\(^1\) Personal communication, C. DiGiovanni, Chief, Foot and Ankle Service, Brown Medical School
\(^3\) ACR Appropriateness Criteria, Chronic ankle pain, 2009

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**MS-30~FOOT**

- **MS-30.1 See Disease/Injury Categories (MS-4 through MS-19)**
  - Studies can be approved as above if applicable to the foot.
- **MS-30.2 Sprain/Fracture/Dislocation/Subluxation (Lisfranc tarsometatarsal fracture)**
  - Injuries to the mid foot should have plain x-rays performed initially to rule out fracture or frank dislocation.
    - Subtle tarsometatarsal dislocation of the foot (Lisfranc fracture) can be difficult to see on plain x-ray, and noncontrast CT (CPT®73700) or MRI (CPT®73718) is indicated when this injury is suspected even though plain x-rays are negative.*
    - Orthopedic evaluation is helpful if a tarsometatarsal dislocation/subluxation is suspected since treatment is usually operative.*
  - All other injuries with negative x-rays should be treated conservatively for a 4 to 6 week period prior to considering advanced imaging.
  - **Stress fracture:**
    - Plain x-rays are usually negative initially and become positive at 3 to 4 weeks. Bone scan will be positive within 72 hours of onset.
    - Treatment includes protected weight bearing with or without casting.
    - Occasionally surgery is necessary, particularly for 5th metatarsal fractures.
    - Periodic follow-up plain x-rays will usually show progressive healing.
If stress fracture is suspected, bone scan should be performed prior to considering advanced imaging.
   - However, if bone scan is not accessible (e.g. due to Tc-99m shortage), MRI without contrast (CPT®73718) can be performed.

References:
- ACR Appropriateness Criteria, Stress/Insufficiency fracture, 2008

- **MS-30.3 Tendonitis**
  - Plain x-rays should be performed initially to rule out entities such as calcific tendonitis/bursitis.*
    *Am Fam Physician 1998 Feb;57(4):667-674
  - A trial of at least 6 to 8 weeks of conservative therapy which might include NSAIDS/cortisone dosepack, and physical therapy or a physician-directed home exercise program is warranted prior to considering advanced imaging.
  - MRI without contrast (CPT®73718) is the appropriate study if advanced imaging is indicated.
  - Orthopedic evaluation is helpful in determining the need for advanced imaging.

- **MS-30.4 Tendon Rupture**
  - Posterior tibial and peroneal tendon ruptures are the most commonly ruptured foot/ankle tendons after the Achilles tendon.
  - A thorough history, recent physical exam, and plain x-rays should be performed initially.
  - With posterior tibial tendon rupture, there is usually flattening of the longitudinal arch and often valgus of the heel.
  - With this scenario, particularly if unilateral and accompanied by medial foot and/or ankle pain, noncontrast ankle MRI (CPT®73721) can be approved. MRI can differentiate between tendonitis and rupture of the posterior tibial tendon.
  - Peroneal tendon rupture/subluxation can occur, particularly with lateral ankle sprains.
    - Noncontrast ankle MRI (CPT®73721) is indicated *after a 4 week period of conservative therapy if disability and lateral pain persist.*
    - Orthopedic or Podiatry evaluation is helpful in determining the need for advanced imaging.

- **MS-30.5 Morton’s Neuroma**
  - Usually a clinical diagnosis,¹ and treatment is conservative and might include shoe modification, metatarsal pads, and local injection of cortisone.
  - A thorough history, recent physical exam, and plain x-rays should be performed initially.
However, if surgery is being planned, foot MRI without and with contrast (CPT®73720)\textsuperscript{2} can be approved as a preoperative test for diagnosis confirmation.

**References:**
- \textsuperscript{2}ACR Appropriateness Criteria, Chronic foot pain. 2008

- **MS-30.6 Plantar Fasciitis**
  - **Definition:** Inflammation of plantar fascia at its insertion into the calcaneus (at bottom of heel). Often, but not always, associated with heel spur.
  - A thorough history, recent physical exam, and plain x-rays should be performed initially.
  - Diagnosis is made clinically and no advanced imaging is necessary.
  - Treatment is conservative with heel pads, stretching, NSAIDS, and steroid injections.
  - Surgery is considered only in longstanding cases that have been unresponsive to conservative therapy.
  - The surgery involves release of the plantar fascia at its attachment to the calcaneus.
  - **Reference:**

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

- **MS-30.7 Diabetic Foot Infection**
  - Foot infections are quite common in diabetes and range from mild cellulitis to osteomyelitis and usually involve multiple organisms.
  - Treatment ranges from oral antibiotics in mild cases to intravenous antibiotics and even amputation in severe cases of osteomyelitis with gangrene.
  - Plain x-rays should be performed initially.\textsuperscript{1}
    - If positive for osteomyelitis, no further advanced imaging is necessary.
    - If negative, foot MRI without and with contrast (CPT®73720) can be approved.\textsuperscript{2}
  - \textsuperscript{1}Greene WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed. Rosemont,IL, American Academy of Orthopaedic Surgeons, 2001, p.211
  - \textsuperscript{2}Greene WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed. Rosemont,IL, American Academy of Orthopaedic Surgeons, 2001, p.687

- **MS-30.8 Charcot Foot**
  - Charcot foot arthropathy: progressive disease that causes significant deformity of the foot and ankle in patients with diabetic neuropathy.
  - Diagnosis is usually made based upon clinical manifestations such as painful, warm, swollen foot without sensation, supported by plain x-rays.
• **MS-30.9 Tarsal Tunnel Syndrome**
  - **Definition:** Nerve entrapment of the posterior tibial nerve in the area of the medial malleolus analogous to carpal tunnel syndrome in the wrist.
  - A thorough history, recent physical exam, and plain x-rays should be performed initially.
  - Diagnosis is usually made clinically but can be difficult.
  - Nerve conduction studies and clinical evaluation are indicated initially.
  - Ankle MRI without contrast (CPT®73721) can be approved as a preoperative study if mass/lesion is suspected as etiology of the entrapment.* or to evaluate for associated coalition.
  - If the concern is for a tarsal coalition, noncontrast CT (CPT®73700) is an acceptable alternative.
  - **Reference:**

• **MS-30.10 Sinus Tarsi Syndrome**
  - Characterized by chronic lateral ankle pain after lateral ankle sprain.
  - Etiology is strain/sprain of the intertarsal ligaments of the subtalar joint.
  - A thorough history, recent physical exam, and plain x-rays should be performed initially.
  - Diagnosis is made clinically and confirmed by injection of lidocaine into the sinus tarsi.
  - Treatment is conservative.
    ➢ Surgery (excision of sinus tarsi contents or even subtalar fusion in severe cases) is reserved for conservative treatment failures.*
  - Ankle MRI without contrast (CPT®73721) is the most appropriate imaging study, but should be reserved for patients in whom the diagnosis is unclear or for patients in whom surgery is being considered.*
  - Orthopedic or Podiatry evaluation is helpful in determining the need for advanced imaging.

• **MS-30.11 Chronic Lateral Ankle/Foot Pain**
  - See **MS-29.4 Ankle Impingement** in the Ankle guidelines
  - See **MS-29.7 Lateral Instability** in the Ankle guidelines
  - See **MS-30.10 Sinus Tarsi Syndrome** in the Foot guidelines.
o A thorough history, recent physical exam, and plain x-rays should be performed initially.

o Another less common entity seen as a cause of chronic ankle pain is a split tear of the peroneus brevis tendon after lateral ankle sprain. *
   

o Treatment of chronic lateral ankle/foot pain initially is conservative, but ankle MRI without contrast (CPT®73721) can be approved after 6 to 8 weeks of failed conservative therapy.

o Orthopedic or Podiatry evaluation is helpful in determining the need for advanced imaging.
MUSCULOSKELETAL GUIDELINE REFERENCES

MS-2~Imaging Techniques
- ACR Appropriateness Criteria, Musculoskeletal Imaging topics.

MS-3~3-D Rendering
- ACR 2006 Coding Update Sept/Oct 2005

MS-4~Avascular Necrosis (AVN)
- Major N. Pitfalls in Musculoskeletal Imaging—the Hip.

MS-5~Fracture and Dislocation

MS-6~Foreign Body

MS-7~Ganglion Cysts

MS-8~Gout/Pseudogout/Crystal Deposition Disease
- Pittman JR and Bross MH, Diagnosis and management of gout. Am Fam Physician 1999 April;59(7); 1799-1806, 1810.

MS-9~Infection

MS-10~Mass

MS-11~Muscle/Tendon Unit Injuries/Diseases
MS-12~Osteoarthritis


MS-13~Osteochondritis Dissecans


MS-14~Osteoporosis


MS-15~Paget’s Disease


MS-17~Rheumatoid Arthritis (RA) and Inflammatory Arthritis


MS-18~Tendonitis/Bursitis


**MS-19~Total Joint Prosthesis**

**MS-20~Shoulder**
**MS-20.2 Shoulder Pain**

**MS-20.3~Impingement**

**MS-20.4~Tendinitis**

**MS-20.5~Tendon (Biceps Long Head) Rupture**
MS-20.6~Rotator Cuff Tear

MS-20.7~Dislocation/Subluxation/Labral Tear

MS-20.8~Frozen Shoulder/Adhesive Capsulitis

MS-20.9~Osteoarthritis

MS-20.10~Acromioclavicular (AC) Separation

MS-20.11~Sternoclavicular (SC) Dislocation

MS-20.12~Post-operative Shoulder

MS-21~Elbow

**MS-22~Wrist**


**MS-24~Pelvis**


**MS-25~Hip**

**MS-25.2~Hip Pain**


**MS-25.4~Osteoarthritis**


**MS-25.5~Avascular Necrosis (AVN)**

MS-25.6~Labral Tear

MS-25.8~Piriformis Syndrome

MS-26~Knee

MS-26.3 Knee Pain

MS-26.4~Meniscus Tear

MS-26.5~Ligament Tear

MS-26.6~Osteoarthritis

MS-26.7~Patellar Dislocation/Subluxation

MS-26.8~Chondromalacia Patella

MS-26.9~Baker’s Cyst

**MS-26.10~Post-operative Knee**

**MS-26.11~Plica (Symptomatic Synovial Plica/Medial Synovial Shelf)**

**MS-26.12~Knee Swelling/Effusion**

**MS-27~Leg Length Discrepancy**

**MS-28~Leg Pain/Calf Tenderness**

**MS-29~Ankle**
**MS-29.3~Sprain (including Avulsion Fracture)**

**MS-29.4~Impingement**

**MS-29.5~Tendonitis**

**MS-29.6~Ruptured Achilles Tendon (Partial/Complete)**
- *Lower Extremity Musculoskeletal Disorders-A Guide to Diagnosis and Treatment*.

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MS-29.7—Lateral Instability
- Personal communication, C. DiGiovanni, Chief, Foot and Ankle Service, Brown Medical School.

MS-30—Foot
MS-30.2—Sprain/Fracture/Dislocation/Subluxation (Lisfranc tarsometatarsal fracture)

MS-30.3 Tendonitis

MS-30.4—Tendon Rupture

MS-30.5—Morton’s Neuroma

MS-30.6—Plantar Fasciitis

MS-30.7—Diabetic Foot Infection

MS-30.8 Charcot Foot

MS-30.9—Tarsal Tunnel Syndrome

**MS-30.10~Sinus Tarsi Syndrome**