

MUSCULOSKELETAL GUIDELINES

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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 11/30/08

ABBREVIATIONS for MUSCULOSKELETAL GUIDELINES

AP	anteroposterior view
AVN	avascular necrosis
CMS	Centers for Medicare and Medicaid Services
CPK	creatinine phosphokinase
CT	computed tomography
DEXA (DXA)	dual energy x-ray absorptiometry
DMARDS	disease modifying anti-rheumatic drugs
EMG	electromyogram
ESR	erythrocyte sedimentation rate
MRI	magnetic resonance imaging
NCV	nerve conduction velocity
NSAIDS	non steroidal anti-inflammatory drugs
RA	rheumatoid arthritis
RICE	rest, ice, compression, elevation
SI	sacro-iliac
WBC	white blood cell count

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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.
- **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*

<http://www.acr.org> Accessed November 28, 2006

DISEASE/ INJURY CATEGORY (ALPHABETICAL ORDER)

MS-4~AVASCULAR NECROSIS (AVN)

- If AVN is suspected, plain x-rays should be performed initially.¹
- If plain x-rays are positive, no further imaging is necessary, as follow-up can be performed with plain x-rays.²
- MRI without contrast is the modality of choice to evaluate **suspected** AVN with negative X-rays.¹
- 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.
- If the differential diagnosis is AVN vs labral tear, then MRI (CPT 73721) of the more symptomatic hip should be performed initially. If that hip is positive for AVN, then MRI (CPT 73721) of the other hip can be imaged if requested.

¹ *ACR Appropriateness Criteria, Chronic Hip Pain, 2008*

² *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

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.^{1,2}
- 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.

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

²Greene WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed. Rosemont,IL, American Academy of Orthopaedic Surgeons, 2001, p.36

• 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 suspected, MRI without contrast is the appropriate imaging study.
- CT without contrast can be approved if MRI is contraindicated.*

*ACR Appropriateness Criteria, Chronic Ankle Pain, 2005

- **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, particularly for 5th metatarsal fractures.
- 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** are 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.

*Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont,IL, American Academy of Orthopaedic Surgeons, 2001, p.356

- **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.508

- **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*

*Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont,IL, American Academy of Orthopaedic Surgeons, 2001, pp 18-19

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:**
 - *Ganglions-Topic Overview. WebMD, Sept 29, 2006.*
<http://www.webmd.com>. Accessed December 8, 2007

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.
- Imaging studies are not very useful in diagnosing initial attacks of acute gouty arthritis.
- Radiographic findings are generally nonspecific.
 - Advanced imaging is not used routinely in the evaluation of crystal deposition disease.
 - 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.*
**Green WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed. Rosemont,IL, American Academy of Orthopaedic Surgeons, 2001, p.211*
 - 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.
 - 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.
- **MS-9.3 Bone (Osteomyelitis)**
 - MRI without and with contrast if plain x-rays are negative.*
**Greene WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed. Rosemont,IL, American Academy of Orthopaedic Surgeons, 2001, p.687*

- 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, 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.*
*Scott-Conner CEH and Radebold K. *Lipomas*. eMedicine, April 17, 2006, <http://www.emedicine.com>. Accessed September 11, 2007
 - 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.*
*Krolo I, Babiae N, Marotti M, et. al. *Ultrasound in the Evaluation of Sports Muscular Injury*. Jan 7, 2000. <http://www.acta-clinica.kbsm.hr>. Accessed October 16, 2007
- 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, 2005

- **MS-10.3 Soft tissue mass with calcification on x-ray**
 - CT without contrast if Myositis Ossificans (bone formation in muscle tissue after trauma) is suspected.*
 - *ACR Appropriateness Criteria, Soft tissue masses, 2005
 - MRI without and with contrast if not demonstrated to be Myositis Ossificans by CT*
 - *ACR Appropriateness Criteria, Soft tissue masses, 2005

- **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, Bone Tumors, 2005

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 Physician 1999 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 guidelines
 - ¹ ACR Appropriateness Criteria, Chronic ankle pain, 2005
 - ² Greene WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed. Rosemont, IL, Academy of Orthopaedic Surgeons, 2001, p.330

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 in the knee (MRI without contrast) and preoperative planning in joint replacement (CT without contrast).
 - ¹ ACR Appropriateness Criteria, Chronic hip pain, 2008
 - ² American Academy of Orthopedic Surgeons- Knee Osteoarthritis Guidelines <http://www.aaos.org>. Accessed November 27, 2006
 - ³ Am Fam Physician 2000 March;61(6):1795-1804
 - ⁴ Greene WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, pp 320-321
 - ⁵ Stacy GS and Basu PA. Osteoarthritis, Primary. eMedicine, January 24, 2007, <http://www.emedicine.com>. Accessed October 1, 2007
 - Am Fam Physician 2000 April;61(8):2391-2400

MS-13~OSTEOCHONDRITIS DISSECANS

- 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 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 osteoporosis³

- 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

¹ Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed.

Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, p.58

² Grisanti JM and Simonelli C. *A Call to Action: Integrating Current Clinical Evidence in the Assessment and Treatment of Osteoporosis*. CME Program 2006. [http:// www.medscape.com/viewprogram/5401](http://www.medscape.com/viewprogram/5401). Accessed December 8, 2007

³ *Physician's Guide to Prevention and Treatment of Osteoporosis- 2003 National Osteoporosis Foundation*

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

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.

MS-17~RHEUMATOID ARTHRITIS (RA) and INFLAMMATORY ARTHRITIS

- The rheumatological 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*.

In Bohndorf K, Pope TL, Jr., Imhof H. (Eds.).

Musculoskeletal Imaging, New York, Thieme New York, 2001, pp.338-343

- 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

- 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.*

*Cluett J. *Tendonitis diagnosis*. About.c com:Orthopedics, May 16, 2008, http://orthopedics.about.com/cs/sportsmedicine/a/tendonitis_2.htm. Accessed December 3, 2008

- 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.
- Standard technetium bone scan has good sensitivity, but poor specificity* being positive in any condition causing inflammatory response including aseptic loosening.
 - * *J Bone Joint Surg Br* 2006 Feb;88(2):149-155
- 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)**
 - Studies can be approved if applicable to the shoulder.
- **MS-20.2 Shoulder Pain**
 - A thorough history, recent physical exam, and plain x-rays should be performed initially.
 - “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.”*
 - * *American Academy of Orthopaedic Surgeons-- Universe of Adult Patients with Localized Shoulder Pain Symptoms—Phase I Guideline, 2001.*
<http://www.aaos.org/Research/guidelines>. Accessed September 26, 2007

- **Reference:**

- *J Shoulder Elbow Surgery* 2005 May/June;14(3):233-237

- **MS-20.3 Impingement**

- Definition: Pressure-induced tendonitis of the rotator cuff (chiefly the supraspinatus) caused by the acromion process during shoulder abduction.
- Diagnosis is generally by history and physical exam with the “impingement sign” (abduction and internal rotation of the shoulder) being positive.
- 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}
- Orthopedic consultation is helpful in determining when to proceed with imaging.⁵
- 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

- ² *American Academy of Orthopedic Surgeons- Shoulder Pain Guideline* 2001. [http:// www.aaos.org](http://www.aaos.org). Accessed November 27, 2006

- ³ *Am Fam Physician* 2000 June;61(11):3291-3300
<http://www.aafp.org>. Accessed November 27, 2006

- ⁴ Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, p.138

- ⁵ *Upper Extremity Musculoskeletal Disorders Guidelines* 2003.

- Brigham and Women’s Hospital. <http://www.brighamand womens.org>
Accessed November 28, 2006

- **MS-20.4 Tendinitis**

- 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.

- ¹ *Am Fam Physician* 1998 Feb;57(4):667-674

² *American Academy of Orthopaedic Surgeons- Shoulder Pain Guideline* 2001. <http://www.aaos.org>. Accessed November 27, 2006

³ *Am Fam Physician* 2000 June;61(11):3291-3300 <http://www.aafp.org>. Accessed November 27, 2006

⁴ Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, p.138

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

- Common shoulder injury which can also occur spontaneously.
- Usually diagnosed clinically.
- 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.
 - *Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, p.146

- **MS-20.6 Rotator Cuff Tear**

- The rotator cuff is composed of three musculotendinous units: subscapularis (anteriorly), supraspinatus (superiorly), and the infraspinatus (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, Speed's 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 weeks¹ 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 73221) is appropriate.³

¹ *American Academy of Orthopedic Surgeons-Shoulder Pain Guideline* 2001

<http://www.aaos.org>. Accessed November 27, 2006

² *Am Fam Physician* 1998 Feb;57(4):667-674

³ *Am Fam Physician* 2000 June;61(11):3291-3300

<http://www.aafp.org>. Accessed November 27, 2006

- Noncontrast shoulder MRI (CPT 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.
- Shoulder MRI **with contrast** (MR arthrogram CPT 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 *Am Fam Physician* 2000 June;61(11):3291-3300
<http://www.aafp.org>. Accessed November 27, 2006

² Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons 2001, pp.148-149

- 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 approved ¹ 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.
- 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 Orthopaedic Surgeons- Shoulder Pain Guideline* 2001 <http://www.aaos.org>. Accessed November 27, 2006

- *Am Fam Physician* 2000 June;61(11):3291-3300
<http://www.aafp.org>. Accessed November 27, 2006
 - *Upper Extremity Musculoskeletal Disorders Guidelines* 2003. Brigham and Women's Hospital. <http://www.brighamandwomens.org>
Accessed November 28, 2006
 - Advanced imaging is rarely indicated.
 - Orthopedic evaluation is helpful in determining the need for advanced imaging.
- **MS-20.9 Osteoarthritis**
 - Treatment is generally conservative and might include NSAIDs, heat, range of motion exercises, and steroid injection.
 - References:
 - Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, pp.119-120
 - *American Academy of Orthopaedic Surgeons- Shoulder Pain Guideline* 2001
<http://www.aaos.org>. Accessed November 27, 2006
 - *Am Fam Physician* 2000 June;61(11):3291-3300
<http://www.aafp.org>. Accessed November 27, 2006
 - Advanced imaging is rarely needed in osteoarthritis.
 - **Exception:** noncontrast shoulder CT or MRI (CPT 73200 or 73221) as ordered by the operating surgeon for preoperative planning.
- **MS-20.10 Acromioclavicular (AC) Separation**
 - Plain x-rays should be performed initially to rule out fracture.
 - 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.*
 - 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.*
 - Treatment is conservative initially with surgery being reserved for grade III separations that fail conservative therapy.*
 - *Seade EL, Bryan WJ, Bartz RL, Josey R.
Acromioclavicular Joint Injury. eMedicine, October 26, 2006,
<http://www.emedicine.com>. Accessed September 28, 2007
- **MS-20.11 Post-operative Shoulder**
 - Diagnosing the etiology of pain or other symptoms after shoulder 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 are complicated.*

*Mohana-Borges A, Chung C, Resnick D. MR Imaging and MR Arthrography of the Postoperative Shoulder: Spectrum of Normal and Abnormal Findings. <http://radiographics.rsna.org/cgi/content/full/24/1/69>. Accessed October 16, 2007

- 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
 - ² *Upper Extremity Musculoskeletal Disorders Guidelines 2003*. Brigham and Women's Hospital. <http://www.brighamandwomens.org> Accessed November 28, 2006
 - 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

MS-22~WRIST

- See Disease/Injury Categories (MS-4 through MS-19)
 - Studies can be approved as above if applicable to the wrist.
- **Rheumatoid Arthritis**
 - See MS-17 Rheumatoid arthritis and Inflammatory Arthritis
- **Carpal Tunnel Syndrome**
 - Also see SP-11.5 Cervical Radiculopathy, Differential diagnosis in the Spine guidelines and PN-2.1 Carpal tunnel syndrome in the Peripheral Nerve Disorders guidelines.
 - Diagnosis is made clinically and with NCV/EMG.
 - Imaging studies are rarely indicated.
 - 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.
 - *National Institute of Neurological Disorders and Stroke. Carpal Tunnel Fact Sheet Updated August 2, 2006
 - <http://ninds.nih.gov/disorders/carpaltunnel/detailcarpaltunnel.htm>
 - Accessed November 28, 2006
- **Ligament Injuries**
 - Plain x-rays should be performed initially.
 - 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.*
 - *Forearm, wrist, & hand (acute & chronic), not including carpal tunnel syndrome. May 16, 2007,
 - <http://www.guideline.gov>. Accessed October 2, 2007
 - Since ligament injuries of the wrist are generally difficult to diagnose, a noncontrast wrist MRI (CPT 73221) can be performed.
 - 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.
 - *American Academy of Orthopedic Surgeons- Clinical Guideline on Wrist Pain <http://www.aaos.org>.
 - Accessed November 28, 2006

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 is helpful.
 - If plain x-rays are equivocal, CT or MRI without contrast (CPT 73200 or 73218) can be performed.
- 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**
 - 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.*
*Kane WJ. *Fractures of the Pelvis*. In Rockwood CA, Jr., Green DP. (Eds.). *Fractures in Adults Volume 2*. 2nd Ed. Philadelphia, J.B. Lippincott, 1984, p.1163
- **Sacro-iliac Joints (SI Joints)**
 - Also see SP-9.5 Ankylosing Spondylitis in the Spine guidelines.
 - Rheumatology evaluation is helpful in assessing the need for advanced imaging.

MS-25~HIP

- **MS-25.1 See Disease/Injury Categories (MS-4 through MS-19)**
 - Studies can be approved as above if applicable to the hip.
- **MS-25.2 Hip Pain**
 - A thorough history, recent physical exam, and plain x-rays should be performed initially.
 - True hip pain is almost always anterior and often accompanied by a painful and or limited range of motion of the hip.
 - 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, 2005

- 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.
- 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.*
 - *Malanga GA, Eisenberg ME, Andrus SG. Degenerative Lumbar Disc Disease in the Mature Athlete. eMedicine. April 6, 2006, <http://www.emedicine.com>. Accessed October 15, 2007
- 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.
- 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.*
 - *Greene WB (Ed.). Essentials of Musculoskeletal Care. 2nd Ed. Rosemont,IL, American Academy of Orthopaedic Surgeons, 2001, p. 295
- Orthopedic specialist evaluation is helpful in determining the appropriate imaging pathway.

- **MS-25.3 Suspected Occult Hip Fracture**

- 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.
 - *ACR Appropriateness Criteria, Chronic hip pain,2008
 - *Lower Extremity Musculoskeletal Disorders-A Guide to Diagnosis and Treatment 2003. 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 (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

³ Stacy GS and Basu PA. *Osteoarthritis, Primary*. eMedicine, January 24, 2007, <http://www.emedicine.com>. 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.
- 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.* If the differential diagnosis is AVN vs labral tear, then MRI (CPT 73721) of the more symptomatic hip should be performed initially. If that hip is positive for AVN, then MRI (CPT 73721) of the other hip can be imaged if requested.

*ACR Appropriateness Criteria. *Chronic hip pain*, 2008

*Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, pp. 322-333

- 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.
- **MS-25.8 Piriformis Syndrome**
 - Also see PN-2.4 Sciatic neuropathy in the Peripheral Nerve Disorders 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.*
**Orthop Clin North Am 2004 Jan;35(1):65-71*
 - 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~KNEE

- **MS-26.1 See Disease/Injury Categories (MS-4 through MS-19)**
 - Studies can be approved as above if applicable to the knee.
- **MS-26.2 General (History, Physical exam, Mechanism of injury)**
 - A recent careful history, physical examination, and plain x-rays should be performed prior to considering advanced imaging.
 - **History of mechanism of injury** is very important.
 - Most meniscal and ligament tears are sustained due to twisting type injuries.
 - **Physical exam** is very important.
 - Almost all significant 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.
 - **Effusion:** see MS-26.12 Knee Effusion
- **MS-26.3 Nontraumatic Knee Pain**
 - 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.^{1,2}
 - 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,³ 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*
 - ²*American Academy of Orthopaedic Surgeons- Knee Osteoarthritis Guidelines. <http://www.aaos.org>. Accessed September 28, 2007*
 - ³*New Zealand Guidelines Group. The Diagnosis and Management of Soft Tissue Knee Injuries, 2003*
- **MS-26.4 Meniscus Tear**
 - Plain x-rays should be performed initially^{1, 2} to rule out other problems such as osteochondral fractures or joint mice (loose bodies) that can mimic meniscus 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

² American Academy of Orthopedic Surgeons Knee Injury Guideline 2001
<http://www.aaos.org>. Accessed November 27, 2006

³ New Zealand Guidelines Group, The Diagnosis and Management of Soft Tissue Knee Injuries 2003

- **MS-26.5 Ligament Tear**

- 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), 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

¹ American Academy of Orthopedic Surgeons Knee Injury Guideline 2001
<http://www.aaos.org>. Accessed November 27, 2006

² ACR Appropriateness Criteria, Nontraumatic knee pain, 2008

- **MS-26.6 Osteoarthritis**

- 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.
 - MRI knee without contrast (CPT 73721) can be approved for patients being considered for unicompartmental knee replacement (medial or lateral) if plain x-rays do not show significant arthritis in the other side of the joint.
- 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

¹ Institute for Clinical Systems Improvement (ICSI), Diagnosis and Treatment of Adult Degenerative Joint Disease. Updated April 7, 2005.
<http://www.icsi.org>. Accessed November 27, 2006

² Arthritis & Rheumatism 2000 Sept;43(9):1905-1915

³ AJR 2006 June;186(6):1778-1782

- **MS-26.7 Patellar Dislocation/Subluxation**
 - Dislocation/subluxation of the patella is largely a clinical diagnosis.
 - Plain x-rays should be performed initially to rule out resulting osteochondral fractures.
 - Treatment is conservative and might include splinting followed by aggressive quadriceps exercises.
 - 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 shown that most common surgical procedures for patellar tracking problems result in medial displacement of the patella.²
 - 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.

¹ Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, p.389

² *Radiology* 1989 Sept;172:799-804
- **MS-26.8 Chondromalacia Patella**
 - Degeneration of hyaline cartilage on the articular surface of the patella, femur or tibia.
 - Diagnosis is made clinically based upon the patient's symptoms and clinical examination of the knee.
 - Plain x-rays are helpful in demonstrating anatomic variations associated with chondromalacia.*
 - MRI does show abnormalities of the joint surface cartilage, but is rarely necessary for diagnosis.
 - The role of MRI in this condition is currently being investigated.*
 - Also see MS-26.7 Patellar Dislocation/Subluxation
 - * *Chondromalacia Patella, Patellofemoral Syndrome*. Lahey Clinic, <http://www.lahey.org/medical/ortho/updates/patella.asp>. Accessed October 1, 2007
 - Treatment is conservative and might include anti-inflammatory medication and exercises to strengthen the quadriceps.
- **MS-26.9 Baker's Cyst**
 - See also PVD-7.3 Lower extremity edema in the Peripheral Vascular Disease guidelines
 - **Definition:** Cyst posterior to the knee which is almost always associated, in adults, with intra-articular knee pathology.
 - Ultrasound is the indicated initial imaging study.¹
 - It is generally accepted that Baker's cysts in adults are not amenable to surgical excision because they will almost always recur.²
 - Noncontrast knee MRI (CPT 73721) is only indicated if surgical excision is being considered.
 - ¹ *University of Michigan Health System Knee Pain Guideline- 2005*
 - ² *Baker's Cyst/Popliteal Cysts. Wheelless' Textbook of Orthopaedics*

- **MS-26.10 Post-operative Knee**
 - Diagnosing the etiology of pain or other symptoms after knee 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 are complicated.*
 - **Radiology* 2003;229:159
 - 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-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}
 - MRI is of limited value in the diagnosis.²
 - ¹ Morrissey RT and Weinstein SL (Eds.). *Lovell and Winter's Pediatric Orthopaedics*. 6th Ed. Philadelphia, Uppinortt Williams and Wilkins, p.1413
 - ² Bigelow TL and Mehlman CT. *Plica Syndrome*. eMedicine, July 2, 2004, <http://www.emedicine.com>. Accessed December 10, 2007

- **MS-26.12 Knee 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.
 - 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
 - Trial of conservative therapy which might include NSAIDS, steroid burst, 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 deposit diseases should be performed prior to considering advanced imaging.

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.*
**International Pediatrics 2004;19(3):132-133*
- Radiographic 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”.
**Journal of Pediatric Orthopaedics 2005 Nov/Dec;25(6):747-749*
- Advanced imaging is generally not indicated.

MS-28~LEG PAIN/CALF TENDERNESS

- Causes of leg pain are multiple and can include trauma, vascular disease, overuse syndromes, 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:**
 - *Emerg Med 2006;38(6):24-30*

MS-29~ANKLE

- **MS-29.1 See Disease/Injury Categories (MS-4 through MS-19)**
 - Studies can be approved as above if applicable to the ankle.
- **MS-29.2 One study/area only**
 - 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 approved.**
- **MS-29.3 Sprain (including Avulsion Fracture)**
 - Plain x-rays should be performed initially to rule out fracture.¹
 - If plain x-rays are negative, a 6 to 8 week trial of conservative therapy is warranted prior to considering advanced imaging.²
 - 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}
- Alternatively, ankle CT without contrast (CPT 73700) can be approved, especially if requested by the Orthopedic or Podiatry specialist.
 - **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, 2005
 - 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**

- 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.
- 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 73701) can be approved.²
- Posterior impingement often involves an os trigonum (accessory foot bone). Ankle MRI without contrast (CPT 73721) can be approved.
 - 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, 2005

- **MS-29.5 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 ankle without contrast (CPT 73721) is the appropriate study if advanced imaging is indicated.
- Orthopedic evaluation is helpful in determining the need for advanced imaging.

- **MS-29.6 Ruptured Achilles Tendon (Partial/Complete)**
 - **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 the usual treatment and prompt referral to Orthopedics is helpful.*
 - **Lower Extremity Musculoskeletal Disorders- A Guide to Diagnosis and Treatment 2003.* Brigham and Women's Hospital, <http://www.brighamandwomens.org>. Accessed November 28, 2006
 - Advanced imaging is rarely indicated as a preoperative test.
 - MRI without contrast (CPT 73721) can be approved if requested by the operating surgeon.
 - **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.
 - **References:**
 - *Lower Extremity Musculoskeletal Disorders-A Guide to Diagnosis and Treatment.* 2003 Brigham and Women's Hospital. <http://www.brighamandwomens.org>. Accessed November 28, 2006
 - *ACR Appropriateness Criteria, Chronic ankle pain, 2005*
- **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
 - Conservative treatment is generally done first with physical therapy.²
 - A lateral heel/sole wedge may be prescribed.
 - Ankle MRI without contrast (CPT 73721) or MR arthrography (CPT 73722)³ can be approved if surgery to reconstruct the lateral ankle ligament complex is planned.
 - ¹ Personal communication, C. DiGiovanni, Chief, Foot and Ankle Service, Brown Medical School
 - ² Greene WB (Ed.). *Essentials of Musculoskeletal Care.* 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, p.435
 - ³ *ACR Appropriateness Criteria, Chronic ankle pain, 2005*

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.*
 - *American Journal of Orthopedics 2006 Aug. pp.376-384*
 - 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.
 - **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.508

- **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.

- 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.
 - *Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont,IL, American Academy of Orthopaedic Surgeons, 2001, pp.436, 497-498
 - 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.
 - However, if surgery is being planned, foot MRI without and with contrast (CPT 73720)² can be approved as a preoperative test for diagnosis confirmation.
 - References:
 - ¹Lower Extremity Musculoskeletal Disorders-A Guide to Diagnosis and Treatment. 2003 Brigham and Women's Hospital. <http://www.brighamandwomens.org>. Accessed November 28, 2006
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 - Gonzalez P and Bowman RG. Morton neuroma. eMedicine, June 7, 2006. <http://www.emedicine.com/pmr/fulltopic/topic81.htm>. Accessed December 4, 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.
 - 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:**
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 - 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.¹
 - If positive for osteomyelitis, no further advanced imaging is necessary.
 - If negative, foot MRI without and with contrast (CPT 73720) can be approved.²

¹ Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, p.211

² Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, p.687

- **MS-30.8 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.
- 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.

*Greene WB (Ed.). *Essentials of Musculoskeletal Care*. 2nd Ed. Rosemont, IL, American Academy of Orthopaedic Surgeons, 2001, pp.511-512

- If the concern is for a tarsal coalition, noncontrast CT (CPT 73700) is an acceptable alternative.

- **Reference:**

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- **MS-30.9 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.
- 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.*

**The Physician and Sportsmedicine* 2000 May;28(5) <http://www.physsportsmed.com/issues/2000>. Accessed November 27, 2006

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

- **MS-30.10 Chronic Lateral Ankle/Foot Pain**

- See MS-29.4 Ankle Impingement, MS-29.7 Lateral Instability in the Ankle guidelines, and MS-30.9 Sinus Tarsi Syndrome in the Foot guidelines.
- 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. *

*D Resnick, *Internal Derangements of Joints 2006:*
Imaging-Arthroscopic Correlation. Washington, DC,
Oct.31- Nov. 4, 2006

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

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MS-28~Leg Pain/Calf Tenderness

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MS-29~Ankle

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MS-29.6~Ruptured Achilles Tendon (Partial/Complete)

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MS-30~Foot

MS-30.2~Sprain/Fracture/Dislocation/Subluxation (Lisfranc tarsometatarsal fracture)

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MS-30.4~Tendon Rupture

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MS-30.5~Morton's Neuroma

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MS-30.8~Tarsal Tunnel Syndrome

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