

RULE 17, EXHIBIT 6

**Lower Extremity Injury  
Medical Treatment Guidelines**

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Department of Labor and Employment  
DIVISION OF WORKERS' COMPENSATION**



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# DEPARTMENT OF LABOR AND EMPLOYMENT

## Division of Workers' Compensation

CCR 1101-3

RULE 17, EXHIBIT 6

### LOWER EXTREMITY INJURY MEDICAL TREATMENT GUIDELINES

#### A. INTRODUCTION

This document has been prepared by the Colorado Department of Labor and Employment, Division of Workers' Compensation (Division) and should be interpreted within the context of guidelines for physicians/providers treating individuals qualifying under Colorado Workers' Compensation Act as injured workers with lower extremity injuries.

Although the primary purpose of this document is advisory and educational, these guidelines are enforceable under the Workers' Compensation Rules of Procedure, 7 CCR 1101-3. The Division recognizes that acceptable medical practice may include deviations from these guidelines, as individual cases dictate. Therefore, these guidelines are not relevant as evidence of a provider's legal standard of professional care.

To properly utilize this document, the reader should not skip nor overlook any sections.

## B. GENERAL GUIDELINES PRINCIPLES

The principles summarized in this section are key to the intended implementation of all Division of Workers' Compensation guidelines and critical to the reader's application of the guidelines in this document.

1. **APPLICATION OF THE GUIDELINES** The Division provides procedures to implement medical treatment guidelines and to foster communication to resolve disputes among the provider, payer, and patient through the Workers' Compensation Rules of Procedure. In lieu of more costly litigation, parties may wish to seek administrative dispute resolution services through the Division or the Office of Administrative Courts.
2. **EDUCATION** of the patient and family, as well as the employer, insurer, policy makers and the community should be the primary emphasis in the treatment of lower extremity pain and disability. Currently, practitioners often think of education last, after medications, manual therapy, and surgery. Practitioners must develop and implement an effective strategy and skills to educate patients, employers' insurance systems, policy makers and the community as a whole. An education-based paradigm should always start with inexpensive communication providing reassuring information to the patient. More in-depth education currently exists within a treatment regime employing functional restorative and innovative programs of prevention and rehabilitation. No treatment plan is complete without addressing issues of individual and/or group patient education as a means of facilitating self-management of symptoms and prevention.
3. **TREATMENT PARAMETER DURATION** Time frames for specific interventions commence once treatments have been initiated, not on the date of injury. Obviously, duration will be impacted by patient compliance, as well as availability of services. Clinical judgment may substantiate the need to accelerate or decelerate the time frames discussed in this document.
4. **ACTIVE INTERVENTIONS** emphasizing patient responsibility, such as therapeutic exercise and/or functional treatment, are generally emphasized over passive modalities, especially as treatment progresses. Generally, passive interventions are viewed as a means to facilitate progress in an active rehabilitation program with concomitant attainment of objective functional gains.
5. **ACTIVE THERAPEUTIC EXERCISE PROGRAM** goals should incorporate patient strength, endurance, flexibility, coordination, and education. This includes functional application in vocational or community settings.
6. **POSITIVE PATIENT RESPONSE** results are defined primarily as functional gains that can be objectively measured. Objective functional gains include, but are not limited to, positional tolerances, range-of-motion (ROM), strength, and endurance, activities of daily living (ADL), cognition, psychological behavior, and efficiency/velocity measures that can be quantified. Subjective reports of pain and function should be considered and given relative weight when the pain has anatomic and physiologic correlation. Anatomic correlation must be based on objective findings.
7. **RE-EVALUATE TREATMENT EVERY 3 TO 4 WEEKS** If a given treatment or modality is not producing positive results within 3 to 4 weeks, the treatment should be either modified or discontinued. Reconsideration of diagnosis should also occur in the event of poor response to a seemingly rational intervention.

8. **SURGICAL INTERVENTIONS** should be contemplated within the context of expected functional outcome and not purely for the purpose of pain relief. The concept of “cure” with respect to surgical treatment by itself is generally a misnomer. All operative interventions must be based upon positive correlation of clinical findings, clinical course, and diagnostic tests. A comprehensive assimilation of these factors must lead to a specific diagnosis with positive identification of pathologic condition(s).
9. **SIX-MONTH TIME FRAME** The prognosis drops precipitously for returning an injured worker to work once he/she has been temporarily totally disabled for more than six months. The emphasis within these guidelines is to move patients along a continuum of care and return to work within a six-month time frame, whenever possible. It is important to note that time frames may not be pertinent to injuries that do not involve work-time loss or are not occupationally related.
10. **RETURN-TO-WORK** is therapeutic, assuming the work is not likely to aggravate the basic problem or increase long-term pain. The practitioner must provide specific physical limitations and the patient should never be released to “sedentary” or “light duty.” The following physical limitations should be considered and modified as recommended: lifting, pushing, pulling, crouching, walking, using stairs, bending at the waist, awkward and/or sustained postures, tolerance for sitting or standing, hot and cold environments, data entry and other repetitive motion tasks, sustained grip, tool usage and vibration factors. Even if there is residual chronic pain, return-to-work is not necessarily contraindicated.

The practitioner should understand all of the physical demands of the patient's job position before returning the patient to full duty and should request clarification of the patient's job duties. Clarification should be obtained from the employer or, if necessary, including, but not limited to, an occupational health nurse, occupational therapist, vocational rehabilitation specialist, or an industrial hygienist.

11. **DELAYED RECOVERY** Strongly consider a psychological evaluation, if not previously provided, as well as initiating interdisciplinary rehabilitation treatment and vocational goal setting, for those patients who are failing to make expected progress 6 to 12 weeks after an injury.

The Division recognizes that 3 to 10% of all industrially injured patients will not recover within the timelines outlined in this document despite optimal care. Such individuals may require treatments beyond the limits discussed within this document, but such treatment will require clear documentation by the authorized treating practitioner focusing on objective functional gains afforded by further treatment and impact upon prognosis.

12. **GUIDELINES RECOMMENDATIONS AND INCLUSION OF MEDICAL EVIDENCE**  
Guidelines are recommendations based on available evidence and/or consensus recommendations. When possible, guideline recommendations will note the level of evidence supporting the treatment recommendation. When interpreting medical evidence statements in the guideline, the following apply:

Consensus means the opinion of experienced professionals based on general medical principles. Consensus recommendations are designated in the guideline as “generally well accepted,” “generally accepted,” “acceptable/accepted,” or “well-established.”

“Some” means the recommendation considered at least one adequate scientific study, which reported that a treatment was effective.

“Good” means the recommendation considered the availability of multiple adequate scientific studies or at least one relevant high-quality scientific study, which reported that a treatment was effective.

“Strong” means the recommendation considered the availability of multiple relevant and high quality scientific studies, which arrived at similar conclusions about the effectiveness of a treatment.

All recommendations in the guideline are considered to represent reasonable care in appropriately selected cases, regardless of the level of evidence or consensus statement attached to it. Those procedures considered inappropriate, unreasonable, or unnecessary are designated in the guideline as “not recommended.”

13. **CARE BEYOND MAXIMUM MEDICAL IMPROVEMENT (MMI)** should be declared when a patient’s condition has plateaued to the point where the authorized treating physician no longer believes further medical intervention is likely to result in improved function. However, some patients may require treatment after MMI has been declared in order to maintain their functional state. The recommendations in this guideline are for pre-MMI care and are not intended to limit post-MMI treatment.

The remainder of this document should be interpreted within the parameters of these guidelines principles that may lead to more optimal medical and functional outcomes for injured workers.

## C. INITIAL DIAGNOSTIC PROCEDURES

The Division recommends the following diagnostic procedures be considered, at least initially, the responsibility of the workers' compensation carrier to ensure that an accurate diagnosis and treatment plan can be established. Standard procedures that should be utilized when initially diagnosing a work-related lower extremity complaint are listed below.

1. **HISTORY-TAKING AND PHYSICAL EXAMINATION (Hx & PE)** are generally accepted, well-established and widely used procedures that establish the foundation/basis for and dictates subsequent stages of diagnostic and therapeutic procedures. When findings of clinical evaluations and those of other diagnostic procedures are not complementing each other, the objective clinical findings should have preference. The medical records should reasonably document the following:
  - a. **History of Present Injury:**
    - i. Mechanism of injury. This includes details of symptom onset and progression. It should include such details as: the activity at the time of the injury, patient description of the incident, and immediate and delayed symptoms. The history should elicit as much detail about these mechanisms as possible.
    - ii. Relationship to work. This includes a statement of the probability that the illness or injury is work-related.
    - iii. History of locking, clicking, popping, giving way, acute or chronic swelling, crepitation, pain while ascending or descending stairs (e.g. handrail used, 'foot by foot' instead of 'foot over foot') inability to weight bear due to pain, intolerance for standing or difficulty walking distances on varied surfaces, difficulty crouching or stooping, and wear patterns on footwear. Patients may also report instability or mechanical symptoms.
    - iv. Any history of pain in back as well as joints distal and proximal to the site of injury. The use of a patient completed pain drawing, Visual Analog Scale (VAS), is highly recommended, especially during the first two weeks following injury to assure that all work related symptoms are addressed.
    - v. Ability to perform job duties and activities of daily living; and
    - vi. Exacerbating and alleviating factors of the reported symptoms. The physician should explore and report on non-work related as well as, work related activities.
    - vii. Prior occupational and non-occupational injuries to the same area including specific prior treatment and any prior bracing devices.
    - viii. Discussion of any symptoms present in the uninjured extremity.
    - ix. Lower extremity injuries are frequently not isolated, but are accompanied by other injuries. In the setting of a traumatic brain injury (TBI), long bone fracture management must consider the effect of TBI on bone metabolism and may require more aggressive treatment. Refer to the

Traumatic Brain Injury Medical Treatment Guidelines, Section G. 3. f,  
Musculoskeletal Complications.

**b. Past History:**

- i. Past medical history includes neoplasm, gout, arthritis, previous musculoskeletal injuries, and diabetes;
- ii. Review of systems includes symptoms of rheumatologic, neurological, endocrine, neoplastic, and other systemic diseases;
- iii. History of smoking, alcohol use, and substance abuse;
- iv. History of corticosteroid use; and
- v. Vocational and recreational pursuits.

**c. Physical Examination:** Examination of a joint should begin with examination of the uninjured limb and include assessment of the joint above and below the affected area of the injured limb. Physical examinations should include accepted tests as described in textbooks or other references and exam techniques applicable to the joint or region of the body being examined, including:

- i. Visual inspection;  
  
Swelling: may indicate joint effusion from trauma, infection or arthritis. Swelling or bruising over ligaments or bones can indicate possible fractures or ligament damage;
- ii. Palpation: for joint line tenderness, effusion, and bone or ligament pain. Palpation may be used to assess tissue tone and contour; myofascial trigger points; and may be graded for intensity of pain. Palpation may be further divided into static and motion palpation. Static palpation consists of feeling bony landmarks and soft tissue structures and consistency. Motion palpation is commonly used to assess joint movement patterns and identify joint dysfunction;
- iii. Assessment of activities of daily living including gait abnormalities, especially after ambulating a distance and difficulties ascending/descending stairs;  
  
Assessment of activities such as the inability to crouch or stoop, may give important indications of the patient's pathology and restrictions;
- iv. Range-of-motion/quality-of-motion; should be assessed actively and passively;
- v. Strength;
- vi. Joint stability;
- vii. Hip exam: In general multiple tests are needed to reliably establish a clinical diagnosis. Spinal pathology and groin problems should always be

considered and ruled out as a cause of pain for patients with hip symptomatology. The following is a list of commonly performed tests;

- A) Flexion-Abduction-External Rotation (FABER-aka Patrick's) test - is frequently used as a test for sacral pathology;
- B) Log roll test - may be used to assess iliofemoral joint laxity;
- C) Ober's is used to test the iliotibial band;
- D) Greater trochanter bursitis is aggravated by external rotation and adduction and resisted hip abduction or external rotation;
- E) Iliopectineal bursitis may be aggravated by stretching the tendon in hip extension;
- F) Internal and external rotation is usually painful in osteoarthritis;
- G) The maneuvers of flexion, adduction and internal rotation (FADIR) will generally reproduce pain in cases of labral tears and with piriformis strain/irritation.

viii. Knee exam: In general multiple tests are needed to reliably establish a clinical diagnosis. The expertise of the physician performing the exam influences the predictability of the exam findings. Providers should be aware that patients with osteoarthritis may have positive pain complaints with various maneuvers based on their osteoarthritis rather than ligamentous or meniscal damage. The following is a partial list of commonly performed tests.

- A) Bilateral thigh circumference measurement: assesses for quadriceps wasting which may occur soon after a knee injury. The circumferences of both thighs should be documented approximately 15 cm above a reference point, either the joint line or patella.
- B) Anterior Cruciate Ligament tests:
  - Lachman's test;
  - Anterior drawer test;
  - Lateral pivot shift test.
- C) Meniscus tests: Joint line tenderness and effusions are common with acute meniscal tears. Degenerative meniscal tears are fairly common in older patients with degenerative changes and may be asymptomatic.
  - McMurray test;
  - Apley compression test;
  - Medial lateral grind test;

- Weight-bearing tests - include Thessaly and Ege's test.

D) Posterior Cruciate Ligament tests:

- Posterior drawer test;
- Extension lag may also be measured passively by documenting the heel height difference with the patient prone.

E) Collateral Ligaments tests:

- Medial stress test – A positive test in full extension may include both medial collateral ligament and cruciate ligament pathology;
- Lateral stress test.

F) Patellar Instability tests:

- Apprehension test;
- J sign;
- Q angle.

ix. Foot and ankle exam:

In general multiple tests are needed to reliably establish a clinical diagnosis. The expertise of the physician performing the exam influences the predictability of the exam findings. Ankle assessments may include anterior drawer exam, talar tilt test, external rotation stress test, ankle ligament stress test and the tibia-fibula squeeze test. Achilles tendon may be assessed with the Thompson's test. Foot examinations may include, assessment of or for: subtalar, midtarsal, and metatarsal-phalangeal joints; tarsal tunnel; and posterior tibial tendon; Morton's neuroma; the piano key test and Lisfranc injury.

- x. If applicable, full neurological exam including muscle atrophy and gait abnormality.
- xi. If applicable to injury, integrity of distal circulation, sensory, and motor function.

2. **RADIOGRAPHIC IMAGING** of the lower extremities is a generally accepted, well-established and widely used diagnostic procedure when specific indications based on history and/or physical examination are present. It should not be routinely performed. The mechanism of injury and specific indications for the radiograph should be listed on the request form to aid the radiologist and x-ray technician. For additional specific clinical indications, see Section E, "Specific Lower Extremity Injury Diagnosis, Testing and Treatment." Indications for initial imaging include any of the following:

- a. The inability to flex knee to 90 degrees or to transfer weight for four steps at the time of the immediate injury and at the initial visit, regardless of limping;
- b. Bony tenderness on any of the following areas: over the head of the fibula; isolated to the patella; of the lateral or medial malleolus from the tip to the distal 6 cm; at the base of the 5<sup>th</sup> metatarsal; or at the navicular;
- c. History of significant trauma, especially blunt trauma or fall from a height;
- d. Age over 55 years;
- e. History or exam suggestive of intravenous drug abuse or osteomyelitis;
- f. Pain with swelling and/or range of motion (ROM) limitation localizing to an area of prior fracture, internal fixation, or joint prosthesis; or
- g. Unexplained or persistent lower extremity pain over two weeks.

Occult fractures, especially stress fractures, may not be visible on initial x-ray. A follow-up radiograph, MRI and/or bone scan may be required to make the diagnosis.

Weight-bearing radiographs are used to assess osteoarthritis and alignment prior to some surgical procedures.

3. **LABORATORY TESTING** Laboratory tests are generally accepted, well-established and widely used procedures. They are, however, rarely indicated at the time of initial evaluation, unless there is suspicion of systemic illness, infection, neoplasia, connective tissue disorder, or underlying arthritis or rheumatologic disorder based on history and/or physical examination. Laboratory tests can provide useful diagnostic information. The Division recommends that lab diagnostic procedures be initially considered the responsibility of the workers' compensation carrier to ensure that an accurate diagnosis and treatment plan can be established.

Tests include, but are not limited to:

- a. Complete blood count (CBC) with differential can detect infection, blood dyscrasias, and medication side effects;
- b. Erythrocyte sedimentation rate, rheumatoid factor, antinuclear antigen (ANA), human leukocyte antigen (HLA), and C-reactive protein (CRP) can be used to detect evidence of a rheumatologic, infection, or connective tissue disorder;
- c. Serum calcium, phosphorous, uric acid, alkaline phosphatase, and acid phosphatase can detect metabolic bone disease;
- d. Liver and kidney function may be performed for prolonged anti-inflammatory use or other medications requiring monitoring; and
- e. Analysis of joint aspiration for bacteria, white cell count, red cell count, fat globules, crystalline birefringence and chemistry to evaluate joint effusion.

4. **OTHER PROCEDURES**

- a. **Joint Aspiration:** is a generally accepted, well-established and widely used procedure when specifically indicated and performed by individuals properly trained in these techniques. This is true at the initial evaluation when history and/or physical examination are of concern for a septic joint or bursitis and for some acute injuries. Particularly at the knee, aspiration of a large effusion can help to decrease pain and speed functional recovery. Persistent or unexplained effusions may be examined for evidence of infection, rheumatologic, or inflammatory processes. The presence of fat globules in the effusion strongly suggests occult fracture.

Risk factors for septic arthritis include joint surgery, knee arthritis, joint replacement, skin infection, diabetes, age greater than 80, immunocompromised states, and rheumatoid arthritis. More than 50% of patients with septic joints have a fever greater than 37.5 degrees centigrade and joint swelling. Synovial white counts of greater than 25,000 and polymorphonuclear cells of at least 90% increase the likelihood of a septic joint.

## D. FOLLOW-UP DIAGNOSTIC IMAGING AND TESTING PROCEDURES

One diagnostic imaging procedure may provide the same or distinctive information as obtained by other procedures. Therefore, prudent choice of procedure(s) for a single diagnostic procedure, a complementary procedure in combination with other procedures(s), or a proper sequential order in multiple procedures will ensure maximum diagnostic accuracy; minimize adverse effect to patients and cost effectiveness by avoiding duplication or redundancy.

All diagnostic imaging procedures have a significant percentage of specificity and sensitivity for various diagnoses. None is specifically characteristic of a certain diagnosis. Clinical information obtained by history taking and physical examination should be the basis for selection and interpretation of imaging procedure results.

When a diagnostic procedure, in conjunction with clinical information, provides sufficient information to establish an accurate diagnosis, the second diagnostic procedure will become a redundant procedure. At the same time, a subsequent diagnostic procedure can be a complementary diagnostic procedure if the first or preceding procedures, in conjunction with clinical information, cannot provide an accurate diagnosis. Usually, preference of a procedure over others depends upon availability, a patient's tolerance, and/or the treating practitioner's familiarity with the procedure.

1. **IMAGING STUDIES** When indicated, the following additional imaging studies can be utilized for further evaluation of the lower extremity, based upon the mechanism of injury, symptoms, and patient history. For specific clinical indications, see Section E, Specific Lower Extremity Injury Diagnosis, Testing, and Treatment. The studies below are listed in frequency of use, not importance.

a. **Magnetic Resonance Imaging (MRI)**: are generally accepted, well-established, and widely used diagnostic procedures. It provides a more definitive visualization of soft tissue structures, including ligaments, tendons, joint capsule, menisci and joint cartilage structures, than x-ray or Computed Axial Tomography in the evaluation of traumatic or degenerative injuries. The addition of intravenous or intra-articular contrast can enhance definition of selected pathologies.

The high field, closed MRI with 1.5 or higher tesla provides better resolution. A lower field scan may be indicated when a patient cannot fit into a high field scanner or is too claustrophobic despite sedation. Inadequate resolution on the first scan may require a second MRI using a different technique or with a reading by a musculoskeletal radiologist. All questions in this regard should be discussed with the MRI center and/or radiologist.

MRIs have high sensitivity and specificity for meniscal tears and ligamentous injuries although in some cases when physical exam findings and functional deficits indicate the need for surgery an MRI may not be necessary. MRI is less accurate for articular cartilage defects (sensitivity 76%) than for meniscal and ligamentous injury (sensitivity greater than 90%).

MRIs have not been shown to be reliable for diagnosing symptomatic hip bursitis.

b. **MR Arthrography (MRA)**: This accepted investigation uses the paramagnetic properties of gadolinium to shorten T1 relaxation times and provide a more intense MRI signal. It should be used to diagnose hip labral tears. Pelvic MRIs

are not sufficient for this purpose. Arthrograms are also useful to evaluate mechanical pathology in knees with prior injuries and/or surgery.

- c. **Computed Axial Tomography (CT)**: is generally accepted and provides excellent visualization of bone. It is used to further evaluate bony masses and suspected fractures not clearly identified on radiographic window evaluation. Instrument scatter-reduction software provides better resolution when metallic artifact is of concern.
- d. **Diagnostic Sonography**: is an accepted diagnostic procedure. The performance of sonography is operator-dependent, and is best when done by a specialist in musculoskeletal radiology. It may also be useful for post-operative pain after total knee arthroplasty (TKA), and for dynamic testing especially of the foot or ankle.
- e. **Lineal Tomography**: is infrequently used, yet may be helpful in the evaluation of joint surfaces and bone healing.
- f. **Bone Scan (Radioisotope Bone Scanning)**: is generally accepted, well-established and widely used. <sup>99m</sup>Tc Technecium diphosphonate uptake reflects osteoblastic activity and may be useful in metastatic/primary bone tumors, stress fractures, osteomyelitis, and inflammatory lesions, but cannot distinguish between these entities.

Bone scanning is more sensitive but less specific than MRI. It is useful for the investigation of trauma, infection, stress fracture, occult fracture, Charcot joint, Complex Regional Pain Syndrome and suspected neoplastic conditions of the lower extremity.

- g. **Other Radionuclide Scanning**: Indium and gallium scans are generally accepted, well-established, and widely used procedures usually to help diagnose lesions seen on other diagnostic imaging studies. <sup>67</sup>Gallium citrate scans are used to localize tumor, infection, and abscesses. <sup>111</sup>Indium-labeled leukocyte scanning is utilized for localization of infection or inflammation.
- h. **Arthrogram**: is an accepted diagnostic procedure. It may be useful in the evaluation of internal derangement of a joint, including when MRI or other tests are contraindicated or not available. Potential complications of this more invasive technique include pain, infection, and allergic reaction. Arthrography gains additional sensitivity when combined with CT in the evaluation of internal derangement, loose bodies, and articular cartilage surface lesions. Diagnostic arthroscopy should be considered before arthrogram when there are strong clinical indications.

2. **OTHER DIAGNOSTIC TESTS** The following diagnostic procedures listed in this subsection are listed in alphabetical order.

- a. **Compartment Pressure Testing and Measurement Devices**: such as pressure manometer, are useful in the evaluation of patients who present symptoms consistent with a compartment syndrome.
- b. **Diagnostic Arthroscopy (DA)**: allows direct visualization of the interior of a joint, enabling the diagnosis of conditions when other diagnostic tests have failed to reveal an accurate diagnosis; however, it should generally not be employed for

exploration purposes only. In order to perform a diagnostic arthroscopy, the patient must have completed at least some conservative therapy without sufficient functional recovery per Section E, Specific Lower Extremity Injury Diagnosis, Testing, and Treatment, and meet criteria for arthroscopic repair.

DA may also be employed in the treatment of acute joint disorders. In some cases, the mechanism of injury and physical examination findings will strongly suggest the presence of a surgical lesion. In those cases, it is appropriate to proceed directly with the interventional arthroscopy.

- c. **Doppler Ultrasonography/Plethysmography:** is useful in establishing the diagnosis of arterial and venous disease in the lower extremity and should usually be considered prior to the more invasive venogram or arteriogram study. Doppler is less sensitive in detecting deep vein thrombosis in the calf muscle area. If the test is initially negative and symptoms continue, an ultrasound should usually be repeated 7 days later to rule out popliteal thrombosis. It is also useful for the diagnosis of popliteal mass when MRI is not available or contraindicated.
- d. **Electrodiagnostic Testing:** Electrodiagnostic tests include, but are not limited to Electromyography (EMG), Nerve Conduction Studies (NCS) and Somatosensory Evoked Potentials (SSEP). These are generally accepted, well-established and widely used diagnostic procedures. The SSEP study, although generally accepted, has limited use. Electrodiagnostic studies may be useful in the evaluation of patients with suspected involvement of the neuromuscular system, including disorder of the anterior horn cell, radiculopathies, peripheral nerve entrapments, peripheral neuropathies, neuromuscular junction and primary muscle disease.

In general, these diagnostic procedures are complementary to imaging procedures such as CT, MRI, and/or myelography or diagnostic injection procedures. Electrodiagnostic studies may provide useful, correlative neuropathophysiological information that would be otherwise unobtainable from standard radiologic studies.

- e. **Personality/Psychological/Psychosocial Evaluations:** are generally accepted and well-established diagnostic procedures with selective use in the acute lower extremity population, but have more widespread use in sub-acute and chronic lower extremity populations.

Diagnostic testing procedures may be useful for patients with symptoms of depression, delayed recovery, chronic pain, recurrent painful conditions, disability problems, and for pre-operative evaluation as well as a possible predictive value for post-operative response. Psychological testing should provide differentiation between pre-existing depression versus injury-caused depression, as well as post-traumatic stress disorder.

Formal psychological or psychosocial evaluation should be performed on patients not making expected progress within 6 to 12 weeks following injury and whose subjective symptoms do not correlate with objective signs and tests. In addition to the customary initial exam, the evaluation of the injured worker should specifically address the following areas:

- i. Employment history;

- ii. Interpersonal relationships — both social and work;
- iii. Leisure activities;
- iv. Current perception of the medical system;
- v. Results of current treatment;
- vi. Perceived locus of control;
- vii. History of smoking, alcohol use, and substance abuse; and
- viii. Childhood history, including abuse and family history of disability.

This information should provide clinicians with a better understanding of the patient, thus allowing for more effective rehabilitation.

The evaluation will determine the need for further psychosocial interventions, and in those cases, a Diagnostic Statistical Manual (DSM) of Mental Disorders diagnosis should be determined and documented. An individual with a PhD, PsyD, or Psychiatric MD/DO credentials should perform initial evaluations, which are generally completed within one to two hours. When issues of chronic pain are identified, the evaluation should be more extensive and follow testing procedures as outlined in the Division's Chronic Pain Disorder Medical Treatment Guidelines.

- ❖ Frequency: One time visit for evaluation. If psychometric testing is indicated as a portion of the initial evaluation, time for such testing should not exceed an additional two hours of professional time.

- f. **Venogram/Arteriogram:** is useful for investigation of vascular injuries or disease, including deep venous thrombosis. Potential complications may include pain, allergic reaction, and deep vein thrombosis.

- 3. **SPECIAL TESTS** are generally well-accepted tests and are performed as part of a skilled assessment of the patient's capacity to return-to-work, his/her strength capacities, and physical work demand classifications and tolerances. The procedures in this subsection are listed in alphabetical order.

- a. **Computer-Enhanced Evaluations:** may include isotonic, isometric, isokinetic and/or isoinertial measurement of movement, range of motion, balance, endurance or strength. Values obtained can include degrees of motion, torque forces, pressures or resistance. Indications include determining validity of effort, effectiveness of treatment and demonstrated motivation. These evaluations should not be used alone to determine return-to-work restrictions.

- ❖ Frequency: One time for evaluation. Can monitor improvements in strength every 3 to 4 weeks up to a total of 6 evaluations.

- b. **Functional Capacity Evaluation (FCE):** is a comprehensive or modified evaluation of the various aspects of function as they relate to the worker's ability to return-to-work. Areas such as endurance, lifting (dynamic and static), postural

tolerance, specific range of motion, coordination and strength, worker habits, employability, as well as psychosocial aspects of competitive employment may be evaluated. Components of this evaluation may include: (a) musculoskeletal screen; (b) cardiovascular profile/aerobic capacity; (c) coordination; (d) lift/carrying analysis; (e) job-specific activity tolerance; (f) maximum voluntary effort; (g) pain assessment/psychological screening; and (h) non-material and material handling activities.

When an FCE is being used to determine return to a specific jobsite, the provider is responsible for fully understanding the job duties. A jobsite evaluation is frequently necessary. FCEs cannot be used in isolation to determine work restrictions. The authorized treating physician must interpret the FCE in light of the individual patient's presentation and medical and personal perceptions. FCEs should not be used as the sole criteria to diagnose malingering. Full FCEs are rarely necessary. In many cases, a work tolerance screening will identify the ability to perform the necessary job tasks. FCEs are not necessary to assign permanent impairment ratings in the Colorado workers' compensation system.

- ❖ Frequency: Can be used 1) initially to determine baseline status; and 2) for case closure when patient is unable to return to pre-injury position and further information is desired to determine permanent work restrictions. Prior authorization is required for FCEs performed during treatment.

- c. **Jobsite Evaluation:** is a comprehensive analysis of the physical, mental and sensory components of a specific job. These components may include, but are not limited to: (a) postural tolerance (static and dynamic); (b) aerobic requirements; (c) range of motion; (d) torque/force; (e) lifting/carrying; (f) cognitive demands; (g) social interactions; (h) visual perceptual; (i) sensation; (j) coordination; (k) environmental requirements of a job; (l) repetitiveness; and (m) essential job functions including job licensing requirements. Job descriptions provided by the employer are helpful but should not be used as a substitute for direct observation.

A jobsite evaluation may include observation and instruction of how work is done, what material changes (desk, chair) should be made, and determination of readiness to return to work.

Requests for a jobsite evaluation should describe the expected goals for the evaluation. Goals may include, but are not limited to the following:

- i. To determine if there are potential contributing factors to the person's condition and/or for the physician to assess causality;
- ii. To make recommendations for, and to assess the potential for ergonomic changes;
- iii. To provide a detailed description of the physical and cognitive job requirements;
- iv. To assist the patient in their return to work by educating them on how they may be able to do their job more safely in a bio-mechanically appropriate manner; and/or

v. To give detailed work/activity restrictions.

- ❖ Frequency: One time with additional visits as needed for follow-up visits per jobsite.

d. **Vocational Assessment:** Once an authorized practitioner has reasonably determined and objectively documented that a patient will not be able to return to her/her former employment and can reasonably prognosticate final restrictions, implementation of a timely vocational assessment can be performed. The vocational assessment should provide valuable guidance in the determination of future rehabilitation program goals. It should clarify rehabilitation goals, which optimize both patient motivation and utilization of rehabilitation resources. The effectiveness of vocational rehabilitation may be enhanced when performed in combination with work hardening or work conditioning. If prognosis for return to former occupation is determined to be poor, except in the most extenuating circumstances, vocational assessment should be implemented within 3 to 12 months post-injury. Declaration of Maximum Medical Improvement should not be delayed solely due to lack of attainment of a vocational assessment.

- ❖ Frequency: One time with additional visits as needed for follow-up.

e. **Work Tolerance Screening (Fitness for Duty):** is a determination of an individual's tolerance for performing a specific job based on a job activity or task. It may include a test or procedure to specifically identify and quantify work-relevant cardiovascular, physical fitness and postural tolerance. It may also address ergonomic issues affecting the patient's return-to-work potential. May be used when a full FCE is not indicated.

- ❖ Frequency: One time for initial screen. May monitor improvements in strength every 3 to 4 weeks up to a total of 6 visits.

**E. SPECIFIC LOWER EXTREMITY INJURY DIAGNOSIS, TESTING, AND TREATMENT**

**1. FOOT AND ANKLE**

**a. Achilles Tendonopathy/or Injury and Rupture (ALTERNATE SPELLING: "TENDINOPATHY"):**

- i. Description/Definition:** Rupture or tear of Achilles tendon or insertional or non-insertional tendonopathy.
- ii. Occupational Relationship:** Tears or ruptures are related to a fall, twisting, jumping, or sudden load on ankle with dorsiflexion. Tendonopathy may be exacerbated by continually walking on hard surfaces.
- iii. Specific Physical Exam Findings:** Swelling and pain at tendon, sometimes accompanied by crepitus and pain with passive motion. Rupture or partial tear may present with palpable deficit in tendon. If there is a full tear, Thompson test will usually be positive. A positive Thompson's test is lack of plantar flexion with compression of the calf when the patient is prone with the knee flexed.
- iv. Diagnostic Testing Procedures:** Radiography may be performed to identify Haglund's deformity; however, many Haglund's deformities are asymptomatic. MRI or ultrasound may be performed if surgery is being considered for tendonopathy or rupture.
- v. Non-operative Treatment Procedures:**
  - A) Initial Treatment:** Cast in non weight-bearing for tears. Protected weight-bearing for other injuries.
  - B)** Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - C)** Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
  - D)** Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. Eccentric training alone or with specific bracing may be used for tendonopathy. Manual therapy may also be used. Therapy will usually include range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by distal and proximal structures. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section F., Therapeutic Procedures, Non-operative.

- E) Steroid injections should generally be avoided in these patients since this is a risk for later rupture.
- F) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- G) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** Total or partial rupture.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Procedures:** Repair of tendons open or percutaneously with or without anchors may be required. Tendon grafts are used for chronic cases or primary surgery failures when tendon tissue is poor.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section F, Therapeutic Procedures, Non-operative.
- B) Treatment may include the following: restricted weight-bearing, bracing, active therapy with or without passive therapy.
- C) Range of motion may begin at 3 weeks depending on wound healing. Therapy and some restrictions will usually continue for 6 to 8 weeks.
- D) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

b. **Aggravated Osteoarthritis:**

i. **Description/Definition:** Internal joint pathology of ankle.

ii. **Occupational Relationship:** The provider must establish the occupational relationship by establishing a change in the patient's baseline condition and a relationship to work activities, for example frequent jumping, climbing, or squatting.

Other causative factors to consider: Prior significant injury to the ankle may predispose the joint to osteoarthritis. In order to entertain previous trauma as a cause, the patient should have a medically documented

injury with radiographs or MRI showing the level of anatomic change. The prior injury should have been at least 2 years from the presentation for the new complaints and there should be a significant increase of pathology on the affected side in comparison to the original imaging or operative reports and/or the opposite un-injured extremity.

iii. **Specific Physical Exam Findings:** Pain within joint, swelling. Crepitus, locking of the joint, reduced range of motion, pain with stress tests, angular deformities.

iv. **Diagnostic Testing Procedures:** X-ray – mechanical axis views, CT, MRI, diagnostic injection.

v. **Non-operative Treatment Procedures:**

- A) **Initial Treatment:** May include orthoses, custom shoes with rocker bottom shoe inserts, and braces. Cane may also be useful.
- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by distal and proximal structures. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section F., Therapeutic Procedures, Non-operative.

- E) Steroid injections may decrease inflammation and allow the therapist to progress with functional exercise and range of motion. Steroid injections under significant pressure should be avoided as the needle may be penetrating the tendon and injection into the tendon can cause possible tendon breakdown, tendon degeneration, or rupture. Injections should be minimized for patients under 30 years of age.

❖ Time to Produce Effect: One injection.

- ❖ Maximum Duration: 3 injections in one year spaced at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- F) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- G) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

**vi. Surgical Indications/Considerations:**

- A) The patient is a good surgical candidate and pain continues to interfere with ADLs after non-surgical interventions including weight control, therapy with active patient participation, and medication.
- B) Refer to Section G. for specific indications for osteotomy, ankle fusion or arthroplasty.
- C) Implants are less successful than similar procedures in the knee or hip. There are no quality studies comparing arthrodesis and ankle replacement. Patients with ankle fusions generally have good return to function and fewer complications than those with joint replacements. Salvage procedures for ankle replacement include revision with stemmed implant or allograft fusion. Given these factors, an ankle arthroplasty requires prior authorization and a second opinion by a surgeon specializing in lower extremity surgery.
- D) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- E) In cases where surgery is contraindicated due to obesity, it may be appropriate to recommend a weight loss program if the patient is unsuccessful losing weight on their own. Coverage for weight loss would continue only for motivated patients who have demonstrated continual progress with weight loss.
- F) Because smokers have a higher risk of non-union and post-operative costs, it is recommended that carriers cover a smoking cessation program peri-operatively. Physicians may monitor

smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

- vii. **Operative Procedures:** Arthroscopy, ankle arthroplasty or fusion. Supramalleolar osteotomies can be considered for patients with deformities or pre-existing hind foot varus or valgus deformities.
- viii. **Post-operative Treatment:**
  - A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section F, Therapeutic Procedures, Non-operative.
  - B) In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
  - C) Treatment may include the following: restricted weight-bearing, bracing, gait training and other active therapy with or without passive therapy.
  - D) Refer to Section G. for Ankle Fusion, Osteotomy, or Arthroplasty for further specific information.
  - E) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

c. **Ankle or Subtalar Joint Dislocation:**

- i. **Description/Definition:** Dislocation of ankle or subtalar joint.
- ii. **Occupational Relationship:** Usually occurs with falling or twisting.
- iii. **Specific Physical Exam Findings:** Disruption of articular arrangements of ankle, subtalar joint may be tested using ligamentous laxity tests.
- iv. **Diagnostic Testing Procedures:** Radiographs, CT scans. MRI may be used to assess for avascular necrosis of the talus which may occur secondary to a dislocation.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Closed reduction under anesthesia with pre- and post-reduction neurovascular assessment followed by casting and weight-bearing limitations.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.

- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range of motion (ROM), active therapies, and a home exercise program. Active therapies include, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by distal and proximal structures. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section F., Therapeutic Procedures, Non-operative.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** Inability to reduce closed fracture, association with unstable fractures.

vii. **Operative Procedures:** Open or closed reduction of dislocation.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section F, Therapeutic Procedures, Non-operative.
- B) Treatment usually includes initial immobilization with restricted weight-bearing, followed by bracing and active therapy with or without passive therapy.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

d. **Ankle Sprain/Fracture:**

i. **Description/Definition:** An injury to the ankle joint due to abnormal motion of the talus that causes a stress on the malleolus and the ligaments. Injured ligaments in order of disruption include the anterior talofibular ligament (ATFL), calcaneofibular ligament (CFL), posterior talofibular ligament (PTFL), deltoid ligaments, and syndesmotic

ligaments. Instability can result from a fracture of a malleolus (malleoli), rupture of ligaments, or a combination. Circumstances surrounding the injury, including consideration of location and additional injuries are of importance. Additionally, the position of the foot at the time of injury is helpful in determining the extent and type of injury. Grading of soft tissue injuries includes:

- A) Grade 1 Injury: those with overstretching or microscopic tears of the ligament, minimal swelling, normal stress testing, and the ability to bear weight.
- B) Grade 2 Injury: have partial disruption of the ligament, significant swelling, indeterminate results on stress testing, and difficulty bearing weight.
- C) Grade 3 Injury: have a ruptured ligament, swelling and ecchymosis, abnormal results on stress testing, and the inability to bear weight. May also include a chip avulsion fracture on x-ray.

ii. **Occupational Relationship:** sudden twisting, direct blunt trauma and falls. Inversion of the ankle with a plantar-flexed foot is the most common mechanism of injury.

iii. **Specific Physical Exam Findings:** varies with individual. With lower grade sprains the ankle may be normal appearing with minimal tenderness on examination. The ability/inability to bear weight, pain, swelling, or ecchymosis should be noted. If the patient is able to transfer weight from one foot onto the affected foot and has normal physical findings, then likelihood of fracture is reduced. Stress testing using the anterior drawer stress test, the talar tilt test and the external rotation stress test may be normal or abnormal depending on the involved ligament.

Syndesmotic injury can occur with external rotation injuries and requires additional treatment. Specific physical exam tests include the squeeze test and external rotation at neutral.

iv. **Diagnostic Testing Procedures:** Radiographs. Refer to Initial Diagnostic Section which generally follows the Ottawa Ankle Rules. The Ottawa Ankle Rules are a decision aid for radiography. Commonly missed conditions include ankle syndesmosis or fractures. The instrument has a sensitivity of almost 100% and a modest specificity, and its use should reduce the number of unnecessary radiographs by 30 to 40%.

For an acute, unstable ankle or a repeat or chronic ankle injury, a MRI and/or diagnostic injection may be ordered. Arthroscopy can be used in unusual cases with persistent functional instability and giving way of the ankle, after conservative treatment, to directly visualize the ruptured ligament(s).

v. **Non-operative Treatment Procedures:**

- A) Initial treatment for patients able to bear weight: NSAIDs, RICE (rest, ice, compression and elevation), and early functional bracing is used. In addition, crutches may be beneficial for comfort. Early functional treatment including range of motion and strengthening exercises along with limited weight-bearing, are preferable to strict immobilization with rigid casting for improving outcome and reducing time to return to work.
- B) Initial treatment for patients unable to bear weight: bracing plus NSAIDs and RICE are used. When patient becomes able to bear weight a walker boot is frequently employed. There is no clear evidence favoring ten days of casting over pneumatic bracing as initial treatment for patients who cannot bear weight three days post injury. There is good evidence that use of either device combined with functional therapy results in similar long-term recovery.

There is some evidence that functional rehabilitation has results superior to six weeks of immobilization.

Small avulsion fractures of the fibula with minimal or no displacement can be treated as an ankle sprain.

For patients with a clearly unstable joint, immobilize with a short leg plaster cast or splint for 2 to 6 weeks along with early weight-bearing.

- C) Balance/coordination training is a well-established treatment which improves proprioception and may decrease incidence of recurrent sprains.
- D) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
- E) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- F) Heel wedges or other orthotics may be used for rear foot varus or valgus deformities.

There is good evidence that semi-rigid orthoses or pneumatic braces prevent ankle sprains during high risk physical activities and they should be used as appropriate after acute sprains.

- G) When fractures are involved refer to comments related to osteoporosis in Section F. 7. h. Therapeutic Procedures, Non-operative, Osteoporosis Management.
- H) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

- I) Return-to-work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- J) Other therapies in Section F. Therapeutic Procedures, Non-operative, including manual therapy may be employed in individual cases.
- K) Hyperbaric oxygen therapy is not recommended.

**vi. Surgical Indications/Considerations:**

- A) Acute surgical indications include sprains with displaced fractures, syndesmotic disruption or ligament sprain associated with a fracture causing instability.
- B) There is no conclusive evidence that surgery as opposed to functional treatment for an uncomplicated Grade I-III ankle sprain improves patient outcome.
- C) Chronic indications are functional problems, such as recurrent instability, remaining after at least 2 months of appropriate therapy including active participation in a non-operative therapy program including balance training.
- D) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- E) If injury is a sprain: Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
- F) If injury is a fracture: Because smokers have a higher risk of non-union and post-operative costs, it is recommended that carriers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

**vii. Operative Treatment:** Repair of fractures or other acute pathology as necessary. Primary ligament ankle reconstruction with possible tendon transplant.

**viii. Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using

therapies as outlined in Section F, Therapeutic Procedures, Non-operative. Treatment may include short-term post surgical casting. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.

There is some evidence that more rapid recovery occurs with functional rehabilitation compared to six weeks of immobilization in a cast.

- B) The surgical procedures and the patient's individual results dictate the amount of time a patient has non weight-bearing restrictions. Fractures usually require 6 to 8 weeks while tendon transfers may be 6 weeks. Other soft tissue repairs, such as the Brostrom lateral ankle stabilization, may be as short as 3 weeks.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

e. **Calcaneal Fracture:**

- i. **Description/Definition:** Osseous fragmentation/separation confirmed by diagnostic studies.
- ii. **Occupational Relationship:** Usually occurs by fall or crush injury.
- iii. **Specific Physical Exam Findings:** Pain with range of motion and palpation of calcaneus. Inability to bear weight, mal-positioning of heel, possible impingement of sural nerve.
- iv. **Diagnostic Testing Procedures:** Radiographs and CT scan to assess for intra-articular involvement. Lumbar films and urinalysis are usually performed to rule out lumbar crush fractures when the mechanism of injury is a fall from a height.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Non weight-bearing 6 to 8 weeks, followed by weight-bearing cast at physician's discretion and active therapy with or without passive therapy.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
  - D) Refer to comments related to osteoporosis in Section F. 7. h. Therapeutic Procedures, Non-operative, Osteoporosis Management.

- E) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
- F) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- G) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** Displacement of fragments, joint depression, intra-articular involvement, mal-position of heel. Sanders Types II and III are generally repaired surgically. However, the need for surgery will depend on the individual case. Relative contraindications: smoking, diabetes, or immunosuppressive disease.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that carriers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

vii. **Operative Procedures:** Open reduction internal fixation. Subtalar fusion may be necessary in some cases when the calcaneus is extremely comminuted. External fixation has been used when the skin condition is poor.

Complications may include wound infections requiring skin graft.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using the therapies as outlined in Section F, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) The patient is usually non weight-bearing for 6 to 8 weeks followed by weight-bearing for approximately 6 to 8 weeks at physician's discretion.
- C) Treatment may include the following: restricted weight-bearing, bracing, active therapy with or without passive therapy.
- D) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

f. **Chondral and Osteochondral Defects:**

i. **Description/Definition:** Cartilage or cartilage and bone defect of the talar surface. May be associated with ankle sprain or other injuries.

- ii. **Occupational Relationship:** Usually caused by a traumatic ankle injury.
- iii. **Specific Physical Exam Findings:** Ankle effusion, pain in joint and with walking.
- iv. **Diagnostic Testing Procedures:** MRI may show bone bruising, osteochondral lesion, or possibly articular cartilage injury. Radiographs, contrast radiography, CT may also be used.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Acute injuries may require immobilization followed by active therapy with or without passive therapy.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
  - D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by distal and proximal structures. Refer to Section F., Therapeutic Procedures, Non-operative.  
  
Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section F., Therapeutic Procedures, Non-operative.
  - E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
  - F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.
- vi. **Surgical Indications/Considerations:**
  - A) Functional deficits not responsive to conservative therapy. Identification of an osteochondral lesion by diagnostic testing procedures should be done to determine the size of the lesion and stability of the joint.

- B) Microfracture is the initial treatment unless there are other anatomic variants such as a cyst under the bone.
- C) Osteochondral Autograft Transfer System (OATS) may be effective in patients without other areas of osteoarthritis, a BMI of less than 35 and a failed microfracture. This procedure may be indicated when functional deficits interfere with activities of daily living and/or job duties 6 to 12 weeks after a failed microfracture with active patient participation in non-operative therapy. This procedure is only appropriate in a small subset of patients and requires prior authorization.
- D) Autologous cartilage cell implant is not FDA approved for the ankle and therefore not recommended.
- E) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- F) Smoking may affect tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Procedures:** Arthroscopy with debridement or shaving of cartilage, microfracture, mosaicplasty, fixation of loose osteochondral fragments.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) Treatment may include the following: restricted weight-bearing, bracing, active therapy with or without passive therapy.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

g. **Heel Spur Syndrome/Plantar Fasciitis:**

i. **Description:** Pain along the inferior aspect of the heel at the calcaneal attachment of the plantar fascia and/or along the course of the plantar fascia.

- ii. **Occupational Relationship:** Condition may be exacerbated by prolonged standing or walking on hard surfaces. Acute injury may be caused by trauma. This may include jumping from a height or hyperextension of the forefoot upon the rear foot.
- iii. **Specific Physical Exam Findings:** Pain with palpation at the inferior attachment of the plantar fascia to the os calcis may be associated with calcaneal spur. Gastrocnemius tightness may be tested with the Silfverskiöld test. The foot is dorsiflexed with the knee extended and then with the knee flexed. The test for gastrocnemius tightness is considered positive if dorsiflexion is greater with the knee flexed than with the knee extended.
- iv. **Diagnostic Testing Procedures:** Standard radiographs to rule out fracture, identify spur after conservative therapy. Bone scans and/or MRI may be used to rule out stress fractures in chronic cases.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** This condition usually responds to conservative management consisting of eccentric exercise of the gastrocnemius, plantar fascial stretching, taping, soft-tissue mobilization, night splints, and orthotics. Therapy may include passive therapy, taping, and injection therapy.
  - B) Shock absorbing shoe inserts may prevent back and lower extremity problems in some work settings.
  - C) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - D) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
  - E) Steroid injections may decrease inflammation and allow the therapist to progress with functional exercise and range of motion. Steroid injections under significant pressure should be avoided as the needle may be penetrating the tendon and injection into the tendon can cause possible tendon breakdown, tendon degeneration, or rupture. Injections should be minimized for patients under 30 years of age.
    - ❖ Time to Produce Effect: One injection.
    - ❖ Maximum Duration: 3 injections in one year spaced at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- F) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- G) After four months of failed therapy, Extracorporeal Shock Wave Therapy (ESWT) trial may be considered prior to surgery. Refer to Section F. 4, Therapeutic Procedures, Non-operative.
- H) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

**vi. Surgical Indications/Considerations:**

- A) Surgery is employed only after failure of at least 4 to 6 months of active patient participation in non-operative treatment.
- B) Indications for a gastrocnemius recession include a positive Silfverskiöld test. This procedure does not weaken the arch as may occur with a plantar fascial procedure, however, there is a paucity of literature on this procedure.
- C) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- D) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

**vii. Operative Treatment Procedures:** Plantar fascial release with or without calcaneal spur removal, endoscopic or open gastrocnemius recession.

**viii. Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section F, Therapeutic Procedures, Non-operative.
- B) Treatment may include the following: restricted weight-bearing, bracing, active therapy with or without passive therapy. Usually non weight-bearing for 7 to 10 days followed by weight-bearing cast or shoe for four weeks; however, depending on the procedure some patients may be restricted from weight-bearing for 4 to 6 weeks.

- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

h. **Metatarsal-Phalangeal, Tarsal-Metatarsal and Interphalangeal Joint Arthropathy:**

- i. **Description/Definition:** Internal derangement of joint.
- ii. **Occupational Relationship:** Jamming, contusion, crush injury, repetitive impact, or post-traumatic arthrosis.
- iii. **Specific Physical Exam Findings:** Pain with palpation and ROM of joint, effusion. The piano key test may be used, where the examiner stabilizes the heel with one hand and presses down on the distal head of the metatarsals, assessing for pain proximally.
- iv. **Diagnostic Testing Procedures:** Radiographs, diagnostic joint injection, CT, MRI.
- v. **Non-operative Treatment Procedures:**
  - A) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - B) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
  - C) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Orthotics and iontophoresis are usually included. A carbon fiber Morton extension may be useful. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by distal and proximal structures. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section F., Therapeutic Procedures, Non-operative.
  - D) Steroid injections may decrease inflammation and allow the therapist to progress with functional exercise and range of motion. Steroid injections under significant pressure should be avoided as the needle may be penetrating the tendon and injection into the tendon can cause possible tendon breakdown,

tendon degeneration, or rupture. Injections should be minimized for patients under 30 years of age.

- ❖ Time to Produce Effect: One injection.
- ❖ Maximum Duration: 3 injections in one year spaced at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:**

- A) Pain, unresponsive to conservative care and interfering with activities of daily living.
- B) First metatarsal arthritis or avascular necrosis can interfere with function and gait.
- C) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- D) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Procedures:** if debridement of the arthritic joint and other conservative treatment is unsuccessful in correcting gait and walking tolerance, other procedures may be considered. Other procedures include: fusion of first metatarsal-phalangeal joint, chilectomy, osteotomies, Keller arthroplasty and soft tissue procedures.

There is some evidence that the first metatarsal-phalangeal joint arthritis is better treated with arthrodesis than arthroplasty for pain and functional improvement. Therefore, total joint arthroplasties are not recommended for any metatarsal-phalangeal joints due to less successful outcomes than fusions. There may be an exception for first and second metatarsal-phalangeal joint arthroplasties when a patient is older than

60, has low activity levels, and cannot tolerate non weight-bearing for prolonged periods or is at high risk for non-union.

Metallic hemi-arthroplasties are still considered experimental as long-term outcomes remain unknown in comparison to arthrodesis, and there is a significant incidence of subsidence. Therefore, these are not recommended at this time.

**viii. Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section F, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) For fusions and osteotomies, reduced weight-bearing and the use of special shoes will be necessary for at least 6 weeks post operative. For other procedures early range-of-motion, bracing, and/or orthotics. Treatment usually also includes other active therapy with or without passive therapy.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

**i. Midfoot (Lisfranc) Fracture/Dislocation:**

- i. **Description/Definition:** Fracture/ligamentous disruption of the tarsal-metatarsal joints, i.e., metatarsal-cuneiform and metatarsal-cuboid bones.
- ii. **Occupational Relationship:** Usually occurs from a fall, crush, axial load with a plantar flexed foot, or abductory force on the forefoot.
- iii. **Specific Physical Exam Findings:** Pain and swelling at the Lisfranc joint, first and/or second metatarsal cuneiform articulation, palpable dorsal dislocation, pain on forced abduction.

Dislocation may not always be apparent. Pronation and supination of the forefoot with the calcaneus fixed in the examiners opposite hand may elicit pain in a Lisfranc injury, distinguishing it from an ankle sprain, in which this maneuver is expected to be painless. The piano key test may be used, where the examiner stabilizes the heel with one hand and presses down on the distal head of the metatarsal, assessing for pain proximally. The dorsalis pedis artery crosses the second metatarsal and may be disrupted. Therefore, the dorsalis pedis pulse and capillary filling should be assessed.

- iv. **Diagnostic Testing Procedures:** X-rays, CT scans, MRI, mid-foot stress x-rays.
- v. **Non-operative Treatment Procedures:**

- A) Initial Treatment: If minimal or no displacement then casting, non weight-bearing 6 to 8 weeks. Orthoses may be used later.
- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F.7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Refer to comments related to osteoporosis in Section F. 7. h. Therapeutic Procedures, Non-operative, Osteoporosis Management.
- E) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
- F) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- G) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** Displacement of fragments or intra-articular fracture. Most Lisfranc fracture/dislocations are treated surgically.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that carriers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

vii. **Operative Procedures:** Open reduction internal fixation with possible removal of hardware at approximately 3 to 6 months, pending healing status. Alternatively, arthrodesis of the medial 2 or 3 metatarsals.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using treatments as outlined in Section F, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) The patient is usually in cast or fracture walker for 6 to 8 weeks non weight-bearing. Orthoses may be indicated after healing.
- C) Treatment may include the following: restricted weight-bearing, bracing, active therapy with or without passive therapy.

- D) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

j. **Morton's Neuroma:**

- i. **Description:** This condition is a perineural fibrosis of the intermetatarsal nerve creating pain and/or paresthesias in the forefoot region. Symptoms appear with weight-bearing activities. Usually occurs between the third and fourth metatarsals or between the second and third metatarsals.
- ii. **Occupational Relationship:** Acute injuries may include excessive loading of the forefoot region caused from jumping or pushing down on the ball of the foot. Non-traumatic occurrences are determined at physician's discretion after review of environmental and biomechanical risk factors.
- iii. **Specific Physical Exam Findings:** Paresthesias and/or pain with palpation of the inter-metatarsal nerve. Mulder's sign, a palpable click from compression of the nerve, or Tinel's sign.
- iv. **Diagnostic Testing Procedures:** Radiographs to rule out osseous involvement. Diagnostic and therapeutic injections. Diagnosis is usually based on clinical judgment; however, MRI and ultrasound imaging have also been employed in difficult cases.
- v. **Non-operative Treatment Procedures:**
- A) **Initial Treatment:** Nonsteroidal anti-inflammatories and foot orthoses are primary treatments.
- B) Medications such as analgesics and anti-inflammatories are usually helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Steroid injections may decrease inflammation and allow the therapist to progress with functional exercise and range of motion. Steroid injections under significant pressure should be avoided as the needle may be penetrating the tendon and injection into the tendon can cause possible tendon breakdown, tendon degeneration, or rupture. Injections should be minimized for patients under 30 years of age.
- ❖ Time to Produce Effect: One injection.
  - ❖ Maximum Duration: 3 injections in one year spaced at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

E) Alcohol injections are thought to produce a chemical neurolysis. Alcohol injection with ultrasound guidance may be used to decrease symptoms.

❖ Optimum Duration: 4 treatments.

❖ Maximum Duration: 7 treatments.

F) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.

G) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:**

A) Functional deficits persisting after 2 to 3 months of active participation in therapy.

B) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.

C) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Procedures:** Excision of the neuroma; nerve transection or transposition.

viii. **Post-operative Treatment:**

A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section F, Therapeutic Procedures, Non-operative.

B) Treatment may involve a period of non weight-bearing for up to two weeks, followed by gradual protected weight-bearing 4 to 6 weeks.

- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

**k. Pilon Fracture:**

- i. **Description/Definition:** Crush/comminution fracture of distal metaphyseal tibia that has intra-articular extensions into the weight-bearing surface of the tibio-talar joint.
- ii. **Occupational Relationship:** Usually from a fall.
- iii. **Specific Physical Exam Findings:** Swelling, pain with weight-bearing, ecchymosis, and palpable tenderness.
- iv. **Diagnostic Testing Procedures:** Radiographs, CT scans.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Prolonged non weight-bearing at physician's discretion.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
  - D) Refer to comments related to osteoporosis in Section F. 7. h. Therapeutic Procedures, Non-operative, Osteoporosis Management.
  - E) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
  - F) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
  - G) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.
- vi. **Surgical Indications/Considerations:** Displacement of fracture, severe comminution necessitating primary fusion.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

vii. **Operative Procedures:** Open reduction internal fixation, fusion, external fixation. In some cases staged procedures may be necessary beginning with external fixation.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using treatment as outlined in Section F, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) Treatment may include the following: restricted weight-bearing, bracing, active therapy with or without passive therapy.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

I. **Posterior Tibial Tendon Dysfunction:**

i. **Description/Definition:** Pain in the posteromedial ankle with plantar flexion.

ii. **Occupational Relationship:** Repetitive or forced plantar flexion after an ankle sprain or athletic activity.

iii. **Specific Physical Exam Findings:** Painful posterior tibial tendon with active and passive non weight-bearing motion, reproduction of pain with forced plantar flexion and inversion of the ankle, difficulty performing single heel raise, pain with palpation from the posterior medial foot along the medial malleolus to the navicular greater tuberosity. The patient should also be evaluated for a possible weak gluteus medius as a contributing factor.

iv. **Diagnostic Testing Procedures:** X-ray, MRI may be used to rule out other diagnoses.

v. **Non-operative Treatment Procedures:**

- A) **Initial Treatment:** Short ankle articulated orthosis and therapy including low-load strengthening exercises with progression to home program. Other active and passive therapy including iontophoresis, orthotics and possible strengthening for the gluteus medius.
- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.

- D) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- E) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:**

- A) Failure of non-operative treatment. Surgery is rarely necessary as success rate for non-operative treatment is around 90%.
- B) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- C) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Procedures:** Resection of anomolous muscle segments or tenolysis. In severe cases, tendon transfer, osteotomies and/or arthrodesis may be necessary.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F, Therapeutic Procedures, Non-operative.
- B) Treatment may include the following: restricted weight-bearing, bracing, active therapy with or without passive therapy.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

m. **Puncture Wounds of the Foot:**

- i. **Description/Definition:** Penetration of skin by foreign object.
- ii. **Occupational Relationship:** Usually by stepping on foreign object, open wound.
- iii. **Specific Physical Exam Findings:** Site penetration by foreign object consistent with history. In early onset, may show classic signs of infection.

- iv. **Diagnostic Testing Procedures:** X-ray, MRI, ultrasound.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Appropriate antibiotic therapy, tetanus toxoid booster, non weight-bearing at physician's discretion.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
  - D) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
  - E) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.
- vi. **Surgical Indications/Considerations:** Cellulitis, retained foreign body suspected, abscess, compartmental syndrome, and bone involvement.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
- vii. **Operative Procedures:** Incision and drainage with cultures.
- viii. **Post-operative Treatment:**
  - A) Patient is usually non-weight-bearing with antibiotic therapy based upon cultures. Follow-up x-rays and/or MRI may be needed to evaluate for osseous involvement.
  - B) An individualized rehabilitation program based upon communication between the surgeon and the therapist using treatment as outlined in Section F, Therapeutic Procedures, Non-operative.
  - C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

n. **Severe Soft Tissue Crush Injuries:**

- i. **Description/Definition:** Soft tissue damage to the foot.
- ii. **Occupational Relationship:** Crush injury or heavy impact to the foot or ankle.
- iii. **Specific Physical Exam Findings:** Pain and swelling over the foot.

iv. **Diagnostic Testing Procedures:** X-ray and other tests as necessary to rule out other possible diagnoses such as compartment syndrome which requires emergent compartment pressure assessment.

v. **Non-operative Treatment Procedures:**

- A) **Initial Treatment:** Usually needs initial rest from work with foot elevation and compression wraps.
- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by distal and proximal structures. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section F., Therapeutic Procedures, Non-operative.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** If compartmental pressures are elevated, emergent fasciotomy is warranted.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Procedures:** Emergency fasciotomy. In some cases a delayed primary closure is necessary.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using

therapies as outlined in Section F, Therapeutic Procedures, Non-operative.

- B) Treatment may include the following: elevation, restricted weight-bearing, active therapy with or without passive therapy.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

**o. Stress Fracture:**

- i. **Description/Definition:** Fracture without displacement usually to metatarsals, talus, navicular or calcaneus.
- ii. **Occupational Relationship:** May be related to repetitive, high impact walking; running; or jumping.
- iii. **Specific Physical Exam Findings:** Pain over the affected bone with palpation or weight-bearing.
- iv. **Diagnostic Testing Procedures:** X-ray, CT, MRI, bone scan
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Immobilization for 4 to 8 weeks with limited weight-bearing may be appropriate.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
  - D) Refer to comments related to osteoporosis in Section F. 7. h. Therapeutic Procedures, Non-operative, Osteoporosis Management.
  - E) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
  - F) There is some evidence that shock absorbing boot inserts may decrease the incidence of stress fractures in military training. Shock absorbing boot inserts of other orthotics may be used in some cases after a stress fracture has occurred or to prevent stress fractures in appropriate work settings.
  - G) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.

H) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** Fractures that have not responded to conservative therapy.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

vii. **Operative Procedures:** Most commonly percutaneous screws or plate fixation.

viii. **Post-operative Treatment:**

A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.

B) Treatment may include the following: restricted weight-bearing, bracing, active therapy with or without passive therapy.

C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

p. **Talar Fracture:**

i. **Description/Definition:** Osseous fragmentation of talus confirmed by radiographic, CT or MRI evaluation.

ii. **Occupational Relationship:** Usually occurs from a fall or crush injury.

iii. **Specific Physical Exam Findings:** Clinical findings consistent with fracture of talus: pain with range of motion, palpation, swelling, ecchymosis. Pain with weight-bearing attempt.

iv. **Diagnostic Testing Procedures:** Radiographs, CT scans, MRI. CT scans preferred for spatial alignment.

v. **Non-operative Treatment Procedures:**

A) **Initial Treatment:** Non weight-bearing for 6 to 8 weeks for non-displaced fractures.

B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.

- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Refer to comments related to osteoporosis in Section F. 7. h. Therapeutic Procedures, Non-operative, Osteoporosis Management.
- E) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
- F) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- G) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** Osseous displacement, joint involvement and instability.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that carriers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

vii. **Operative Procedures:** Open reduction internal fixation.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F, Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) Treatment may include the following: Non weight-bearing 6 to 8 weeks followed by weight-bearing cast. MRI follow-up if avascular necrosis is suspected. Active therapy with or without passive therapy.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

q. **Tarsal Tunnel Syndrome:**

- i. **Description:** Pain and paresthesias along the medial aspect of the ankle and foot due to nerve irritation and entrapment of the tibial nerve or its branches. These symptoms can also be caused by radiculopathy.

- ii. **Occupational Relationship:** Acute injuries may occur after blunt trauma along the medial aspect of the foot. Non-traumatic occurrences are determined at physician's discretion after review of environmental and biomechanical risk factors. Non work related causes include space occupying lesions.
- iii. **Specific Physical Exam Findings:** Positive Tinel's sign. Pain with percussion of the tibial nerve radiating distally or proximally. Pain and paresthesias with weight-bearing activities.
- iv. **Diagnostic Testing Procedures:** Nerve conduction velocity studies of both sides for comparison to normal side. EMGs may be needed to rule out radiculopathy. MRI to rule out space occupying lesions. Diagnostic injections to confirm the diagnosis.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Cast or bracing, immobilization and foot orthoses are appropriate initial management.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
  - D) Return to work with appropriate restrictions should be considered early in the course of treatment.

Orthotics or accommodative footwear is usually necessary before workers can be returned to walking on hard surfaces. Refer to Section F. 13, Return to Work.
  - E) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.
- vi. **Surgical Indications/Considerations:**
  - A) Continued functional deficits after active participation in therapy for 3 to 6 months.
  - B) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.

- C) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Procedures:** Tarsal tunnel release with or without a plantar fascial release.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F, Therapeutic Procedures, Non-operative.
- B) Treatment may include the following: restricted weight-bearing, orthotics, bracing, active therapy with or without passive therapy.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

r. **Tendonopathy:**

For Achilles Tendonopathy, Refer to Section E. 1. a. For other types of tendonopathy of the foot and ankle, General recommendations can be found in Section E 2. k. Tendonopathy of the Knee.

## 2. **KNEE**

a. **Aggravated Osteoarthritis:**

- i. **Description/Definition:** Swelling and/or pain in a joint due to an aggravating activity in a patient with pre-existing degenerative change in a joint. Age greater than 50 and morning stiffness lasting less than 30 minutes are frequently associated. The lifetime risk for symptomatic knee arthritis is probably around 45% and is higher among obese persons.
- ii. **Occupational Relationship:** The provider must establish the occupational relationship by establishing a change in the patient's baseline condition and a relationship to work activities including but not limited to physical activities such as repetitive kneeling or crawling, squatting and climbing, or heavy lifting.

Other causative factors to consider - Previous meniscus or ACL damage may predispose a joint to degenerative changes. In order to entertain previous trauma as a cause, the patient should have medical documentation of the following: meniscectomy; hemarthrosis at the time of the original injury; or evidence of MRI or arthroscopic meniscus or ACL damage. The prior injury should have been at least 2 years from the presentation for the new complaints and there should be a significant increase of pathology on the affected side in comparison to the original imaging or operative reports and/or the opposite un-injured side or extremity.

Body mass index (BMI) of 25 or greater is a significant risk factor for eventual knee replacement.

- iii. **Specific Physical Exam Findings:** Increased pain and/or swelling in a joint with joint line tenderness; joint crepitus; and/or joint deformity.
- iv. **Diagnostic Testing Procedures:** Radiographs, The Kellgren-Lawrence Scale is the standard radiographic scale for knee osteoarthritis. It is based on the development of osteophytes, on bone sclerosis, and on joint space narrowing. The degree of joint space narrowing may not predict disability.

Grade 1: doubtful narrowing of joint space, and possible osteophytic lipping.

Grade 2: definite osteophytes, definite narrowing of joint space.

Grade 3: moderate multiple osteophytes, definite narrowing of joint space, some sclerosis and possible deformity of bone contour.

Grade 4: large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone contour.

MRI to rule out degenerative menisci tears. MRI may identify bone marrow lesions which are correlated with knee pain. These lesions may reflect increased water, blood, or other fluid inside bone and may contribute to the causal pathway of pain. These are incidental findings and should not be used to determine a final diagnosis nor make decisions regarding surgery.

v. **Non-operative Treatment Procedures:**

- A) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F.7, Medications and Medical Management.
- B) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management. There is good evidence for self-management using weight loss, exercise, pacing of activities, unloading the joint with braces, insoles and possibly taping, and medications as needed. Patients should be encouraged to perform aerobic activity such as walking or biking. However, activities such as ladders, stairs and kneeling may be restricted.
- C) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from distal to proximal structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program

targeted to further improve ROM, strength, and normal joint mechanics influenced by structures distal and proximal to the knee. Bracing may be appropriate in some instances. Refer to Section F., Therapeutic Procedures, Non-operative. There is good evidence that there is a small functional advantage for patients involved in exercise with physical therapy supervision over home exercise.

There is some evidence that active physical therapy improves knee function more effectively than medication alone.

Aquatic therapy may be used as a type of active intervention when land-based therapy is not well-tolerated.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section F., Therapeutic Procedures, Non-operative. There is some evidence that ice massage can improve ROM, strengthening of the knee and function. Ice can be used with proper instruction at home or under supervision for up to 20 minute periods 3 times per week or more frequently.

- D) Therapeutic Injections - Both steroids and viscosupplementation may be used.

There is good evidence that intra-articular corticosteroid injection is more effective than placebo in reducing pain from osteoarthritis. Optimum dosage is not known.

Steroid injections may decrease inflammation and allow the therapist to progress with functional exercise and ROM.

- ❖ Time to Produce Effect: One injection.
- ❖ Maximum Duration: 3 injections in one year at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

Viscosupplementation appears to have a longer lasting effect than intra-articular corticosteroids, however, the overall effect varies depending on the timing and the effect studied. Refer to Section F. Therapeutic Procedures, Non-operative, 5.d.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:**

- A) Arthroscopic Debridement and/or Lavage. There is good evidence from a randomized controlled trial that arthroscopic debridement alone provides no benefit over recommended therapy for patients with uncomplicated Grade 2 or higher arthritis. The comparison recommended treatment in the study followed the American College of Rheumatology guidelines which includes: patient education, and supervised therapy with a home program, instruction on ADLs, stepwise use of analgesics and hyaluronic acid injections if desired. Complicated arthritic patients excluded from the study included patients who required other forms of intervention due to the following associated conditions: large meniscal bucket handle tears, inflammatory or infectious arthritis, more than 5 degrees of varus or valgus deformity, previous major knee trauma, or Grade 4 arthritis in 2 or more compartments.

Therefore, arthroscopic debridement and/or lavage are not recommended for patients with arthritic findings and continual pain and functional deficits unless there is meniscal or cruciate pathology. Refer to the specific conditions in this Section E, for specific diagnostic recommendations.

- B) Osteotomy and joint replacement are indicated when conservative treatment, including active participation in non-operative treatment has failed to result in sufficient functional improvement (Refer to Sections G. 4., Knee Arthroplasty, and G. 8., Osteotomy). Tibial osteotomy is a choice for younger patients with unicompartmental disease who have failed conservative therapy.
- C) In cases where surgery is contraindicated due to obesity, it may be appropriate to recommend a weight loss program if the patient is unsuccessful losing weight on their own. Coverage for weight loss would continue only for motivated patients who have demonstrated continual progress with weight loss.
- D) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- E) Because smokers have a higher risk of non-union and post-operative costs, it is recommended that carriers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

vii. **Operative Procedures:** Total or compartmental joint replacement, and osteotomy.

Free-floating interpositional unicompartmental replacement is not recommended for any patients due to high revision rate at 2 years and less than optimal pain relief.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and therapist and using the treatments found in Section F., Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) Refer also to Section G.4., Knee Arthroplasty, or G. 8, Osteotomy as appropriate.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

b. **Anterior Cruciate Ligament (ACL) Injury:**

- i. **Description/Definition:** Rupture or partial rupture of the anterior cruciate ligament; may be associated with other internal derangement of the knee.
- ii. **Occupational Relationship:** May be caused by virtually any traumatic force to the knee but most often caused by a twisting or a hyperextension force, with a valgus stress. The foot is usually planted and the patient frequently experiences a “popping” feeling.
- iii. **Specific Physical Exam Findings:** Findings on physical exam include effusion or hemarthrosis, instability, positive Lachman’s test, positive pivot shift test, and positive anterior drawer test.
- iv. **Diagnostic Testing Procedures:** MRI. Radiographs may show avulsed portion of tibial spine but this is a rare finding.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Acute injuries may require immobilization followed by active therapy with or without passive therapy.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to Section F.7, Medications and Medical Management.
  - C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
  - D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, and a home exercise program. Active

therapies include proprioception training, restoring normal joint mechanics, and clearing dysfunctions from distal and proximal structures bracing may be beneficial. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by structures distal and proximal to the knee (Refer to Section F., Therapeutic Procedures, Non-operative). Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section F., Therapeutic Procedures, Non-operative.

There is no evidence that any particular exercise regime is better for ACL injuries in combination with collateral or meniscus injuries. There is no evidence that knee bracing for non operated ACL improves outcomes although patients may feel that they have greater stability. Non surgical treatment may provide acceptable results in some patients.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

**iv. Surgical Indications/Considerations:** any individual with complaints of recurrent instability interfering with function and physical findings with imaging consistent with an ACL injury.

- A) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- B) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

**v. Operative Procedures:**

Diagnostic/surgical arthroscopy followed by ACL reconstruction using autograft or allograft. If meniscus repair is performed, an ACL repair should be performed concurrently.

Patients tend to have more pain associated with patellar grafts while patients with hamstring replacement seem to have an easier

rehabilitation. Choice of graft is made by the surgeon and patient on an individual basis.

vi. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative.
- B) Treatment may include the following: active therapy with or without passive therapy and bracing. Early active extension does not cause increased laxity at 2 years.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

c. **Bursitis of the Lower Extremity:**

- i. **Description/Definition:** Inflammation of bursa tissue. Bursitis can be precipitated by tendonitis, bone spurs, foreign bodies, gout, arthritis, muscle tears, or infection.
- ii. **Occupational Relationship:** Soft tissue trauma, contusion, or physical activities of the job such as sustained direct compression force, or other repetitive forceful activities affecting the knee.
- iii. **Specific Physical Exam Findings:** Palpable, tender and enlarged bursa, decreased ROM, warmth. The patient may have increased pain with ROM.
- iv. **Diagnostic Testing Procedures:** Lab work may be done to rule out inflammatory disease. Bursal fluid aspiration with testing for connective tissue, rheumatic disease, and infection may be necessary. Radiographs, CT, MRI are rarely indicated.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Diagnostic/therapeutic aspiration, ice, therapeutic injection, treatment of an underlying infection, if present. Aspirations may be repeated as clinically indicated.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F.7, Medications and Medical Management.
  - C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
  - D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, including a home exercise program.

Active therapies include, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from distal and proximal joints. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by structures distal and proximal to the knee. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative.

- E) Steroid Injections- Steroid injections may decrease inflammation and allow the therapist to progress with functional exercise and ROM.

- ❖ Time to Produce Effect: One injection.
- ❖ Maximum Duration: 3 injections in one year spaced at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- F) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- G) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical indications/Considerations:**

- A) Failure of conservative therapy.
- B) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- C) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Procedures:** Surgical excision of the bursa.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using the therapies as outlined in Section F., Therapeutic Procedures, Non-operative.
- B) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

d. **Chondral and Osteochondral Defects:**

- i. **Description/Definition:** Cartilage or cartilage and bone defect at the articular surface of a joint. Deficits may be identified in up to 60% of arthroscopies; however, only around 30% of these lesions are isolated deficits and even fewer are Grade III or IV deficits which might qualify for cartilage grafts.

Defects in cartilage and bone are common at the femoral condyles and patella. The Outerbridge classification grades these defects according to their size and depth.

Grade 0: normal cartilage.

Grade I: softening and swelling of cartilage.

Grade II: partial-thickness defects with surface fissures that do not exceed 1.5 cm in diameter and do not reach subchondral bone.

Grade III: fissuring that reaches subchondral bone in an area with a diameter greater than 1.5 cm.

Grade IV: exposed subchondral bone.

- ii. **Occupational Relationship:** Typically caused by a traumatic knee injury. Chondral deficits can also be present secondary to osteoarthritis.
- iii. **Specific Physical Exam Findings:** Knee effusion, joint line tenderness.
- iv. **Diagnostic Testing Procedures:** MRI may show bone bruising, osteochondral lesion, or possibly articular cartilage injury. Radiographs, contrast radiography, CT may also be used. Diagnostic arthroscopy may be performed when surgical indications as stated in Section VI are met.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Non-operative treatment may be indicated for chondral lesions associated with 1) degenerative changes, refer to aggravated osteoarthritis (Section E.2., a); 2) other knee lesions not requiring surgery (refer to Specific Diagnosis); and/or 3) non-displaced stable lesions. Acute injuries may require

immobilization followed by active therapy with or without passive therapy.

- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F.7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from distal and proximal structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by structures distal and proximal to the knee. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section F., Therapeutic Procedures, Non-operative.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** Surgery for isolated chondral defects may be indicated when functional deficits interfere with activities of daily living and/or job duties after 6 to 12 weeks of active patient participation in non-operative therapy. Identification of the lesion should have been accomplished by diagnostic testing procedures which describe the size of the lesion and stability of the joint. If a lesion is detached or has fluid underlying the bone on MRI, surgery may be necessary before a trial of conservative therapy is completed. Early surgery may consist of fixation or microfracture.

- A) **Microfractures:** Normally the first line of surgical treatment.

Indications: An isolated small full-thickness articular chondral defect with normal joint space, when the patient has not recovered functionally after active participation in therapy. Patients 45 or younger are likely to have better results.

- B) **Osteochondral Autograft Transfer System (OATS)**

Indications: The knee must be stable with intact ligaments and menisci, normal joint space and a large full-thickness defect less than 3 square cm and 1 cm depth. They should be 45 or younger, with a BMI less than 35, and engaged in athletics and/or an equally physically demanding occupation. Surgery may be indicated when functional deficits interfere with activities of daily living and/or job duties after 6 to 12 weeks of active patient participation in non-operative therapy. This procedure may be appropriate in a small subset of patients and requires prior authorization.

- C) Autologous chondrocyte implantation (ACI): These procedures are technically difficult and require specific physician expertise. Cartilage transplantation requires the harvesting and growth of patients' cartilage cells in a highly specialized lab and incurs significant laboratory charges. There is some evidence that transplants and microfractures do not differ on long-term effects. There is some evidence that autologous chondrocyte implantation is not better than microfracture 5 years after surgery in patients younger than 45 presenting with Grade III -IV lesions. This procedure is controversial but may be appropriate in a small subset of patients with physically rigorous employment or recreational activities. It requires prior authorization.

Indications: The area of the lesion should be between 2 square cm and 10 square cm. The patient should have failed 4 or more months of active participation in therapy and a microfracture, abrasion, arthroplasty or drilling with sufficient healing time, which may be from 4 months to over one year. The knee must be stable with intact ligaments and meniscus, and normal joint space. Patients should be 45 or younger, with a BMI less than 35, and engaged in athletics and/or an equally physically demanding occupation.

- D) Contraindications: General contraindications for grafts and transplants are individuals with obesity, inflammatory or osteoarthritis with multiple chondral defects, associated ligamentous or meniscus pathology, or who are older than 55 years of age.
- E) Prior to either graft or implantation intervention the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- F) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

- vii. **Operative Procedures:** Arthroscopy with debridement or shaving of cartilage, microfracture, drilling, abrasion arthroplasty, mosaicplasty or osteochondral autograft (OATS), fixation of loose osteochondral fragments and autologous chondrocyte implantation (ACI).

Radiofrequency treatment is not recommended.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) Treatment may include the following: restricted weight-bearing, bracing, active therapy with or without passive therapy. Full weight-bearing usually occurs by or before 8 weeks.
- C) Continuous passive motion may be used after chondral procedures.
- D) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon. Return to full-duty usually occurs by between four and six months.

e. **Collateral Ligament Pathology:**

- i. **Description/Definition:** Strain or tear of medial or lateral collateral ligaments which provide some stabilization for the knee.
- ii. **Occupational Relationship:** Typically a result of forced abduction and external rotation to an extended or slightly flexed knee.
- iii. **Specific Physical Exam Findings:** Swelling or ecchymosis over the collateral ligaments and increased laxity or pain with applied stress.
- iv. **Diagnostic Testing Procedures:** X-rays to rule out fracture. Imaging is more commonly ordered when internal derangement is suspected.
- v. **Non-operative Treatment Procedures:**
- A) **Initial Treatment:** braces, ice, and protected weight-bearing.
- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions area in Section F.7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.

- D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include proprioception training, restoring normal joint mechanics, and clearing dysfunctions from distal and proximal structures. Bracing may be beneficial. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by structures distal and proximal to the knee. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section F., Therapeutic Procedures, Non-operative.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** Surgery is rarely necessary except when functional instability persists after active participation in non-operative treatment or indications for surgery exist due to other accompanying injuries.

- A) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- B) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Procedures:** Surgical repair.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using procedures as outlined in Section F. Therapeutic Procedures, Non-operative.

- B) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

f. **Meniscus Injury:**

- i. **Description/Definition:** A tear, disruption, or avulsion of medial or lateral meniscus tissue. Locking of the knee or clicking is frequently reported. Patients may describe a popping, tearing, or catching sensation followed by stiffness.
- ii. **Occupational Relationship:** Trauma to the menisci from rotational shearing, torsion, and/or impact injuries while in a flexed position.
- iii. **Specific Physical Exam Findings:** Joint line tenderness, Positive McMurray's test locked joint, or occasionally, effusion. The presence of joint line tenderness has a sensitivity of 85% and a specificity of 31%. The Apley's compression test is also used.
- iv. **Diagnostic Testing Procedures:** Radiographs including standing Posterior/Anterior (PA), lateral, tunnel, and skyline views. MRI is the definitive imaging test. MRI is sensitive and specific for meniscal tear. However, meniscal MRI is frequently abnormal in asymptomatic injuries. In one study of volunteers without a history of knee pain, swelling, locking, giving way, or any knee injury, 16% of the volunteers had MRI-evident meniscal tears; among volunteers older than 45, 36% had MRI-evident meniscal tears. Therefore, clinical correlation with history and physical exam findings specific for meniscus injury is critically important.

Providers planning treatment should therefore consider the patient's complaints and presence of arthritis on MRI carefully, knowing that not all meniscus tears in the middle aged and older population are related to the patients' complaints of pain.

MRI arthrograms are used to diagnose recurrent meniscal tears particularly after previous surgery.

v. **Non-operative Treatment:**

- A) **Initial Treatment:** ice, bracing, and protected weight-bearing.
- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F.7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from distal and proximal

structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by structures distal and proximal to the knee. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** 1. Locked or blocked knee precluding active therapy; 2. Isolated acute meniscus tear with appropriate physical exam findings; 3. Meniscus pathology combined with osteoarthritis in a patient with functional deficits interfering with activities of daily living and/or job duties after 6 to 12 weeks of active patient participation in non-operative therapy.

- A) It is not clear that partial meniscectomy for a chronic degenerative meniscal tear is beneficial. Middle aged patients may do as well without arthroscopy and with therapy.
- B) Meniscal allograft should only be performed on patients between 20 and 45 with an otherwise stable knee, previous meniscectomy with 2/3 removed, lack of function despite active therapy, BMI less than 35, and sufficient joint surface to support repair.
- C) Medial collagen meniscus implants are considered experimental and not generally recommended. No studies have been done to compare this procedure to medial meniscus repair. There is some evidence to support the fact that collagen meniscal implant may slightly improve function and decrease risk of reoperation in patients with previous medial meniscal surgery. It remains unclear as to the extent that the procedure may decrease future degenerative disease. The procedure can only be considered for individuals with previous medial meniscal surgery and intact meniscus rim; without lateral meniscus lesions or Grade 4 Outerbridge lesions; and who need to return to heavy physical labor employment or demanding recreational activities. A second concurring opinion from an orthopedic surgeon specializing in knee surgery and prior authorization is required. Full weight-bearing is not allowed for 6 weeks and most patients return to normal daily activity after 3 months.

- D) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- E) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Treatment:** Repair of meniscus, partial or complete excision of meniscus or meniscus allograft or implant. Debridement of the meniscus is not recommended in patients with severe arthritis as it is unlikely to alleviate symptoms. Complete excision of meniscus should only be performed when clearly indicated due to the long-term risk of arthritis in these patients. Partial meniscectomy or meniscus repair is preferred to total meniscectomy due to easier recovery, less instability, and short-term functional gains.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F., Therapeutic Procedures, Non-operative.
- B) Treatment may include the following: Passive therapy progressively moving toward active therapy, bracing, cryotherapy and other treatments found in Section F.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

g. **Patellar Fracture:**

- i. **Description/Definition:** Fracture of the patella.
- ii. **Occupational Relationship:** Usually from a traumatic injury such as a fall or direct blow
- iii. **Specific Physical Exam Findings:** Significant hemarthrosis/effusion usually present. Extension may be limited and may indicate disruption of the extensor mechanism. It is essential to rule out open fractures; therefore a thorough search for lacerations is important.
- iv. **Diagnostic Testing Procedures:** Aspiration of the joint and injection of local anesthetic may aid the diagnosis. A saline load injected in the joint can also help rule out an open joint injury. Radiographs may be

performed, including tangential (sunrise) or axial views and x-ray of the opposite knee in many cases. CT or MRI is rarely needed.

v. **Non-operative Treatment Procedures:**

- A) Initial Treatment: For non-displaced closed fractures, protected weight-bearing and splinting for 4 to 6 weeks. Hinged knee braces can be used. When radiographs demonstrate consolidation, active motion and strengthening exercise may begin.
- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Refer to comments related to osteoporosis in Section F. 7. h. Therapeutic Procedures, Non-operative, Osteoporosis Management.
- E) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
- F) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions, after bony union has been achieved. They should include bracing then range-of-motion (ROM), active therapies including proprioception training, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures, and a home exercise program. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, restoring normal joint mechanics, influenced by proximal and distal structures. Therapy should include training on the use of adaptive equipment and home and work site evaluations when appropriate. Bracing may be appropriate. Refer to Section F., Therapeutic Procedures, Non-operative.  
  
Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative.
- H) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- I) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

- vi. **Surgical Indications/Considerations:** Open fractures require immediate intervention and may need repeat debridement. Internal fixation is usually required for comminuted or displaced fractures. Non-union may also require surgery.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

- vii. **Operative Procedures:** internal fixation; partial patellectomy or total patellectomy. Total patellectomy results in instability with running or stairs and significant loss of extensor strength. Therefore, this is usually a salvage procedure.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F., Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions. Continuous passive motion may be used post operatively.
- B) Treatment may include protected weight-bearing and active therapy with or without passive therapy for early range of motion if joint involvement.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.
- D) Hardware removal may be necessary after 3 to 6 months.

h. **Patellar Subluxation:**

- i. **Description/Definition:** Incomplete subluxation or dislocation of the patella. Recurrent episodes can lead to subluxation syndrome that can cause frank dislocation of the patella. Patient may report a buckling sensation, pain with extension, or a locking of the knee with exertion.
- ii. **Occupational Relationship:** Primarily associated with a direct contact lateral force. Secondary causes associated with shearing forces on the patella.
- iii. **Specific Physical Exam Findings:** Lateral retinacular tightness with associated medial retinacular weakness, swelling, effusion, and marked pain with patellofemoral tracking/compression and glides. In addition, other findings may include atrophy of muscles, positive patellar apprehension test, and patella alta.
- iv. **Diagnostic Testing Procedures:** CT or Radiographs including Merchant views, Q-angle, and MRI for loose bodies.

v. **Non-operative Treatment Procedures:**

- A) Initial Treatment: Reduction if necessary, ice, taping, and bracing followed by active therapy.
- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F.7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from distal and proximal structures. Taping the patella or bracing may be beneficial. Passive as well as active therapies can be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by structures distal and proximal to the knee. Specific strengthening should be done to optimize patellofemoral mechanics and address distal foot mechanics that influence the patellofemoral joint. Refer to Section F., Therapeutic Procedures, Non-operative.  
  
Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section F., Therapeutic Procedures, Non-operative.
- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:**

- A) Fracture, loose bodies, and recurrent dislocation. Surgical repair of first-time dislocation in young adults generally is not recommended. Retinacular release, quadriceps reefing, and patellar tendon transfer should only be considered for subluxation after 4 to 6 months of active patient participation in non-operative treatment.
- B) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise.

The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.

- C) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Procedures:** arthroscopy with possible arthrotomy; debridement of soft tissue and articular cartilage disruption; open reduction internal fixation with fracture; retinacular release, quadriceps reefing, and patellar tendon or lateral release with or without medial soft-tissue realignment.

viii. **Post-operative Treatment:**

- A) Individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F., Therapeutic Procedures, Non-operative.
- B) Treatment may include active therapy with or without passive therapy, bracing.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

i. **Patellofemoral Pain Syndrome (aka Retropatellar Pain Syndrome):**

i. **Description/Definition:** Patellofemoral pathologies are associated with resultant weakening, instability, and pain of the patellofemoral mechanism. Diagnoses can include patellofemoral chondromalacia, malalignment, persistent quadriceps tendonitis, distal patellar tendonitis, patellofemoral arthrosis, and symptomatic plica syndrome. Patient complains of pain, instability and tenderness that interfere with daily living and work functions such as sitting with bent knees, climbing stairs, squatting, running or cycling.

ii. **Occupational Relationship:** Usually associated with contusion; repetitive patellar compressive forces; shearing articular injuries associated with subluxation or dislocation of patella, fractures, and/or infection.

iii. **Specific Physical Exam Findings:** Findings on physical exam may include retinacular tenderness, pain with patellar compressive ranging, positive patellar glide test, atrophy of quadriceps muscles, positive patellar apprehensive test. Associated anatomical findings may include increased Q angle; ligament laxity, and effusion. Some studies suggest that the patellar tilt test (assessing the patella for medial tilt) and looking for active instability with the patient supine and knee flexed to 15 degrees and an isometric quad contraction, may be most useful for distinguishing normal from abnormal. Most patellar tests are more specific than sensitive.

iv. **Diagnostic Testing Procedures:** Radiographs including tunnel view, axial view of patella at 30 degrees, lateral view and Merchant views. MRI rarely identifies pathology. Occasional CT or bone scans.

v. **Non-operative Treatment Procedures:**

A) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F.7, Medications and Medical Management.

B) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.

C) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. The program should include bracing and/or patellar taping, prone quad stretches, hip external rotation, balanced strengthening, range-of-motion (ROM), active therapies and a home exercise program. Active therapies include proprioception training, restoring normal joint mechanics, and clearing dysfunctions from distal and proximal structures. Passive as well as active therapies may be used for control of pain and swelling. Active therapeutic exercise appears to decrease pain; however, the expected functional benefits are unclear. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM strength, and normal joint mechanics influenced by structures distal and proximal to the knee. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative. Orthotics may be useful in some cases.

D) Knee pain, when associated with abnormal foot mechanics, may be favorably treated with appropriate orthotics.

There is some evidence that pre-fabricated commercially available foot orthotic devices are more beneficial for patients with patellofemoral pain syndrome than flat shoe inserts. They may produce mild side effects such as rubbing or blistering which can be reduced with additional empirical measures such as heat molding or addition, and removal of wedges and inserts until patient comfort is achieved. In some cases, custom semi-rigid or rigid orthotics is necessary to decrease pronation or ensure a proper fit. There is no evidence regarding which orthotic design might be useful.

E) Botulinum toxin injections for the relief of patellofemoral pain are considered experimental and are not recommended.

F) Steroid Injections:

Steroid injections may decrease inflammation and allow the therapist to progress with functional exercise and ROM. Steroid injections under significant pressure should be avoided as the needle may be penetrating the tendon and injection into the tendon can cause possible tendon breakdown, tendon degeneration, or rupture. Injections near the patellar tendon should generally be avoided. Injections should be minimized for patients less than 30 years of age.

- ❖ Time to Produce Effect: One injection.
- ❖ Maximum Duration: 3 injections in one year spaced at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- G) Extracorporeal Shock Wave Therapy (ESWT): There is no good research to support ESWT and therefore, it is not recommended.
- H) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- I) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** patellar tendon disruption, quadriceps tendon rupture/avulsion, fracture. There is no evidence that surgery is better than eccentric training for patellar tendonopathy of the inferior pole (jumper's knee).

- A) Retinacular release, quadriceps reefing, and tibial transfer procedures should only be considered after 4 to 6 months of active patient participation in non-operative treatment in young active patients. There is no evidence that arthroscopy for patellofemoral syndrome is more efficacious than exercise.
- B) Lateral release and reconstruction is not recommended for patellofemoral arthritis or middle aged adults.
- C) In cases of severe Grade III-IV isolated patellofemoral arthritis where walking, steps, and other functional activities are significantly impacted after adequate conservative treatment, prosthesis may be considered in those less than 55 years. A patellofemoral arthroplasty is generally contraindicated if there is patellofemoral instability or malalignment, tibiofemoral mechanical malalignment, fixed loss of knee motion (greater than 10 degrees extension or less than 110 degrees flexion), inflammatory arthritis, and other systemic related issues. For patellar resurfacing, refer to Section G. 4. Knee Arthroplasty.

- D) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- E) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Procedures:** Arthroscopic debridement of articular surface, plica, synovial tissue, loose bodies; arthrotomy; open reduction internal fixation with fracture; patellar prosthesis with isolated Grade III-IV OA, and possible patellectomy for young active patients with isolated arthritis.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative.
- B) Treatment may include active therapy with or without passive therapy; and bracing.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

j. **Posterior Cruciate Ligament (PCL) Injury:**

- i. **Description/Definition:** Rupture of PCL. May be associated with concurrent ACL rupture or collateral ligament injury.
- ii. **Occupational Relationship:** Most often caused by a posterior force directed to flexed knee.
- iii. **Specific Physical Exam Findings:** Findings on physical exam include acute effusion, instability, reverse Lachman's test, reverse pivot shift, posterior drawer test.
- iv. **Diagnostic Testing Procedures:** MRI, radiographs including kneeling view, may reveal avulsed bone.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Ice, bracing, and protected weight-bearing followed by active therapy.

- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F.7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include bracing then range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include proprioception training, restoring normal joint mechanics, and clearing dysfunctions from distal and proximal structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint structures distal and proximal to the knee. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found in Section F., Therapeutic Procedures, Non-operative.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:**

- A) Carefully consider the patients' normal daily activity level before initiation of surgical intervention. Isolated Grade 1 instability does not require surgical intervention. Grades 2 or 3 may have surgical intervention if there remains demonstrable instability which interferes with athletic or work pursuits of the patient. In a second degree strain there is significant posterior motion of the tibia on the femur in active testing. A third degree strain demonstrates rotary instability due to medial or lateral structural damage. Surgery is most commonly done when the PCL rupture is accompanied by multi-ligament injury. Not recommended as an isolated procedure in patients over 50 with Grade 3 or 4 osteoarthritis.
- B) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy

required and the length of partial- and full-disability expected post-operatively.

- C) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vi. **Operative Procedures:** Autograft or allograft reconstruction.

vii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative.
- B) Treatment may include active therapy with or without passive therapy, bracing.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

k. **Tendonopathy:**

i. **Description/Definition:** Inflammation of the lining of the tendon sheath or of the enclosed tendon. Usually occurs at the point of insertion into bone or a point of muscular origin. Can be associated with bursitis, calcium deposits, or systemic connective diseases.

ii. **Occupational Relationship:** Extreme or repetitive trauma, strain, or excessive unaccustomed exercise or work.

iii. **Specific Physical Exam Findings:** Involved tendons may be visibly swollen with possible fluid accumulation and inflammation; popping or crepitus; and decreased ROM.

iv. **Diagnostic Testing Procedures:** Lab work may be done to rule out inflammatory disease. Other tests are rarely indicated.

v. **Non-operative Treatment Procedures:**

- A) **Initial Treatment:** Ice, protected weight-bearing and/or restricted activity, possible taping and/or bracing.
- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F.7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.

- D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, including a home exercise program. Active therapies include, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from distal and proximal structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by structures distal and proximal to the knee. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative.

- E) For isolated patellar tendonopathy, patellar tendon strapping or taping may be appropriate.
- F) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- G) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.
- H) Therapeutic Injections:

Steroid injections may decrease inflammation and allow the therapist to progress with functional exercise and ROM. Steroid injections under significant pressure should be avoided as the needle may be penetrating the tendon and injection into the tendon can cause possible tendon breakdown, tendon degeneration, or rupture. Injections should be minimized for patients less than 30 years of age.

- ❖ Time to Produce Effect: One injection.
- ❖ Maximum Duration: 3 injections in one year spaced at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

vi. **Surgical Indications/Considerations:**

- A) Suspected avulsion fracture, or severe functional impairment unresponsive to a minimum of 4 months of active patient participation in non-operative treatment.

- B) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
  - C) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
- vii. **Operative Procedures:** Tendon repair. Rarely indicated and only after extensive conservative therapy.
- viii. **Post-operative Treatment:**
- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative.
  - B) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

### 3. **HIP AND LEG**

#### a. **Acetabular Fracture:**

- i. **Description/Definition:** Subgroup of pelvic fractures with involvement of the hip articulation.
- ii. **Occupational Relationship:** Usually from a traumatic injury such as a fall or crush.
- iii. **Specific Physical Exam Findings:** Displaced fractures may have short and/or abnormally rotated lower extremity.
- iv. **Diagnostic Testing Procedures:** Radiographs, CT scanning.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Although surgery is frequently required, protected weight-bearing may be considered for un-displaced fractures or minimally displaced fractures that do not involve the weight-bearing surface of the acetabular dome.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.

- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Refer to comments on osteoporosis in Section E.1.d, Ankle Sprain/Fracture.
- E) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
- F) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions, after boney union has been achieved. They should include bracing then range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include ambulation with appropriate assistive device, proprioception training, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by proximal and distal structures. Therapy should include training on the use of adaptive equipment and home and work site evaluations when appropriate. Bracing may be appropriate. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative.

- G) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- H) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** Displaced or unstable fracture.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

vii. **Operative Procedures:** Usually open reduction and internal fixation or total hip replacement.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist, and using therapies as outlined in Section F., Therapeutic

Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing, and exercise progressions.

- B) Treatment usually includes active therapy with or without passive therapy for early range of motion and weight-bearing then progression to, strengthening, flexibility, neuromuscular training, and gait training with appropriate assistive devices.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

**b. Aggravated Osteoarthritis:**

- i. **Description/Definition:** hip pain with radiographic evidence of joint space narrowing or femoral acetabular osteophytes, and sedimentation rate less than 20mm/hr with symptoms. Patients usually have gradual onset of pain increasing with use and relieved with rest, progressing to morning stiffness and then to night pain.
- ii. **Occupational Relationship:** The provider must establish the occupational relationship by establishing a change in the patient's baseline condition and a relationship to work activities including but not limited to repetitive heavy lifting or specific injury to the hip.

Other causative factors to consider: Prior significant injury to the hip may predispose the joint to osteoarthritis. In order to entertain previous trauma as a cause, the patient should have a medically documented injury with radiographs or MRI showing the level of anatomic change. The prior injury should have been at least 2 years from the presentation for the new complaints and there should be a significant increase of pathology on the affected side in comparison to the original imaging or operative reports and/or the opposite un-injured side or extremity.

- iii. **Specific Physical Exam Findings:** Bilateral exam including knees and low back is necessary to rule out other diagnoses. Pain with the hip in external and/or internal hip rotation with the knee in extension is the strongest indicator.
- iv. **Diagnostic Testing Procedures:** standing pelvic radiographs demonstrating joint space narrowing to 2 mm or less, osteophytes or sclerosis at the joint. MRI may be ordered to rule out other more serious disease.
- v. **Non-operative Treatment Procedures:**
  - A) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - B) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint

protection, and weight management. Patient education may also include videos, telephone, follow-up, and pamphlets.

- C) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies and a home exercise program. Active therapies include gait training with appropriate assistive devices, proprioception training restoring normal joint mechanics, and clearing dysfunctions from adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by proximal and distal structures. Therapy should include training on the use of adaptive equipment and home and work site evaluations when appropriate. Refer to Section F., Therapeutic Procedures, Non-operative. There is good evidence that a supervised therapeutic exercise program with an element of strengthening is an effective treatment for hip osteoarthritis.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative. There is some evidence that manual therapy, including stretching and traction manipulation by a trained provider, produces functional improvement in hip osteoarthritis and may be a suitable treatment option.

- 1) Aquatic therapy may be used as a type of active intervention to improve muscle strength and range of motion when land-based therapy is not well-tolerated.
- 2) The use of insoles, adaptive equipment, cane, may be beneficial.
- 3) There is some evidence that acupuncture may produce improvement in hip pain and function, making it a suitable treatment option for patients. Refer to Section F., Therapeutic Procedures, Non-operative.

- D) Steroid Injections - Steroid injections may decrease inflammation and allow the therapist to progress with functional exercise and ROM.

- ❖ Time to Produce Effect: One injection.
- ❖ Maximum Duration: 3 injections in one year spaced at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

**vi. Surgical Indications/Considerations:**

- A) When pain interferes with ADLs and the patient meets the following: 1) low surgical risk, 2) adequate bone quality, and 3) failure of previous non-surgical interventions including weight control, therapy with active patient participation, and medication. Refer to Section G. 5 Therapeutic Procedures-operative, Hip Arthroplasty, for indications specific to the procedure.
- B) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- C) In cases where surgery is contraindicated due to obesity, it may be appropriate to recommend a weight loss program if the patient is unsuccessful losing weight on their own. Coverage for weight loss would continue only for motivated patients who have demonstrated continual progress with weight loss.
- D) Because smokers have a higher risk of non-union and post-operative costs, it is recommended that carriers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

**vii. Operative Procedures: Prosthetic replacement (traditional or minimally invasive), or resurfacing.**

**viii. Post-operative Treatment:**

- A) In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) For prosthetic replacement, refer to Section G. 5. Hip Arthroplasty.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

c. **Femoral Osteonecrosis (Avascular Necrosis (AVN) of the Femoral Head):**

- i. **Description/Definition:** Death of the bone tissue of the femoral head following loss of blood supply to the area. Destruction of the articular surfaces of the hip joint may lead to arthritis.
- ii. **Occupational Relationship:** Trauma resulting in displaced subcapital fracture of the hip or hip dislocation may cause AVN. Previous surgical procedures and systemic steroids may lead to AVN. In the general population risk factors include, but are not limited to alcohol abuse, smoking, Caisson disease (also known as the bends), sickle cell anemia, autoimmune disease, and hypercoagulable states. Often, the cause cannot be identified. Involvement of the opposite hip may occur in more than half of cases not caused by trauma.
- iii. **Specific Physical Exam Findings:** Hip or groin pain made worse by motion or weight-bearing and alleviated by rest is the classical presentation. Symptoms may begin gradually, often months after the vascular compromise of blood flow. A limp may result from the limited toleration of weight-bearing.
- iv. **Diagnostic Testing Procedures:** X-ray abnormalities include sclerotic changes, cystic lesions, joint space narrowing, and degeneration of the acetabulum. The x-ray may be normal in the first several months of the disease process. AVN should be suspected when hip pain occurs and risk factors are present. X-rays should be done first, but may be followed by an MRI. When AVN is not due to trauma, both hips should be imaged.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** protected weight-bearing and bracing followed by active therapy with or without passive therapy. Conservative approaches may suffice when the lesion is small, but larger lesions are expected to require surgical intervention when symptoms are disabling.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management. Weight-bearing restrictions may be appropriate.
  - D) Smoking may affect bone healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
  - E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.

- F) Other therapies in Section F., Therapeutic Procedures, Non-operative, may be employed in individual cases.

vi. **Surgical Indications/Considerations:** Core decompression may be appropriate for some patients with early disease (Stages 1 and 2A) who have functionally disabling symptoms. Femoral head osteotomies or resurfacing hemiarthroplasties may also be appropriate for younger patients when disease is limited to the femoral head. Those 50 or older and patients with total joint collapse or severely limiting disease will usually require an implant arthroplasty.

Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

vii. **Operative Procedures:** Osteotomy, core decompression with or without bone graft, prosthetic replacement. Refer to Section G., Therapeutic Procedures-operative for details.

viii. **Post-operative Treatment:**

- A) Anticoagulant therapy to prevent deep venous thrombosis for most procedures. Refer Section F., Therapeutic Procedures, Non-operative.
- B) Treatment usually includes active therapy with or without passive therapy. Refer to section G and specific procedures for further details.
- C) An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F., Therapeutic Procedures, Non-operative.
- D) Treatment should include gait training with appropriate assistive devices.
- E) Therapy should include training on the use of adaptive equipment and home and work site evaluation when appropriate.
- F) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon

d. **Femur Fracture:**

- i. **Description/Definition:** Fracture of the femur distal to the lesser trochanter.
- ii. **Occupational Relationship:** Usually from a traumatic injury such as a fall or crush.
- iii. **Specific Physical Exam Findings:** May have a short, abnormally rotated extremity. Effusion if the knee joint is involved.
- iv. **Diagnostic Testing Procedures:** Radiographs. Occasionally CT scan or MRI particularly if the knee joint is involved.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Although surgery is usually required, non-operative procedures may be considered in stable, non-displaced fractures and will require protected weight-bearing.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - C) Back pain may occur after femur fracture and should be addressed and treated as necessary.
  - D) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, weight management. Weight-bearing restrictions may be appropriate.
  - E) Refer to comments related to osteoporosis in Section F. 7. h. Therapeutic Procedures, Non-operative, Osteoporosis Management.
  - F) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
  - G) Orthotics such as heel lifts and custom shoe build-ups may be required when leg-length discrepancy persists.
  - H) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
  - I) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.
- vi. **Surgical Indications/Considerations:** Femoral neck fracture or supracondylar femur fracture with joint incongruity.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

vii. **Operative Procedures:** Rod placement or open internal fixation.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist, using therapies as outlined in Section F., Therapeutic Procedures, Non-operative. In all cases, communication between the physician and the therapist is important to the timing of weight-bearing and exercise progression.
- B) Treatment usually includes active therapy with or without passive therapy for protected weight-bearing, early range of motion if joint involvement.
- C) Refer to bone-growth stimulators in Section F. Therapeutic Procedures, Non-operative.
- D) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

e. **Hamstring Tendon Rupture:**

- i. **Description/Definition:** Most commonly, a disruption of the muscular portion of the hamstring. Extent of the tear is variable. Occasionally a proximal tear or avulsion. Rarely a distal injury.
- ii. **Occupational Relationship:** Excessive tension on the hamstring either from an injury or from a rapid, forceful contraction of the muscle.
- iii. **Specific Physical Exam Findings:** Local tenderness, swelling, ecchymosis.
- iv. **Diagnostic Testing Procedures:** Occasionally radiographs or MRI for proximal tears/possible avulsion.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Protected weight-bearing and ice.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, and weight management.

- D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They may include range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include proprioception training, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by proximal and distal structures. Bracing may be appropriate. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

**vi. Surgical Indications/Considerations:**

- A) Surgery is indicated for proximal or distal injuries only when significant functional impairment is expected without repair. If surgery is indicated, it is preferably performed within three months.
- B) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- C) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

**vii. Operative Procedures: Re-attachment of proximal avulsions and repair of distal tendon disruption.**

**viii. Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section F., Therapeutic Procedures, Non-operative. In all cases, communication between the

physician and therapist is important to the timing of weight-bearing and exercise progressions.

- B) Treatment may include protected weight-bearing and active therapy with or without passive therapy. Splinting in a functional brace may reduce time off work.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

f. **Hip Dislocation:**

- i. **Description/Definition:** Disengagement of the femoral head from the acetabulum.
- ii. **Occupational Relationship:** Usually from a traumatic injury such as a fall or crush.
- iii. **Specific Physical Exam Findings:** Most commonly a short, internally rotated, adducted lower extremity with a posterior dislocation and a short externally rotated extremity with an anterior dislocation.
- iv. **Diagnostic Testing Procedures:** Radiographs, CT scanning.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** Urgent closed reduction with sedation or general anesthesia.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
  - D) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include bracing then range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include proprioception training, gait training with appropriate assistive devices, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by proximal and distal structures. Therapy should include training on the use of adaptive equipment and home and work site evaluations when appropriate. Bracing may be appropriate Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

- vi. **Surgical Indications/Considerations:** Failure of closed reduction. Associated fracture of the acetabulum or femoral head, loose fragments in joint or open fracture.

Because smokers have a higher risk of non-union and post-operative costs, when a fracture is involved it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

- vii. **Operative Procedures:** Open reduction of the femoral head or acetabulum and possible internal fixation.

- viii. **Post-operative Treatment Procedures:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section F., Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) Treatment should include gait training with appropriate assistive devices.
- C) Treatment may include protected weight-bearing and active therapy with or without passive therapy for early range of motion.
- D) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

- g. **Hip Fracture:**

- i. **Description/Definition:** Fractures of the neck and peri-trochanteric regions of the proximal femur.
- ii. **Occupational Relationship:** Usually from a traumatic injury such as a fall or crush. Patients with intracapsular femoral fractures have a risk of developing avascular necrosis of the femoral head requiring treatment months to years after the initial injury.

- iii. **Specific Physical Exam Findings:** Often a short and externally rotated lower extremity.
- iv. **Diagnostic Testing Procedures:** Radiographs. Occasional use of CT scan or MRI.
- v. **Non-operative Treatment Procedures:**
  - A) **Initial Treatment:** protected weight-bearing and bracing followed by active therapy with or without passive therapy. Although surgery is usually required, non-operative procedures may be considered in stable, non-displaced fractures.
  - B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
  - C) Back pain may occur after hip fracture and should be addressed and treated as necessary.
  - D) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management. Weight-bearing restrictions may be appropriate.
  - E) Refer to comments on osteoporosis in Section E.1, d. Ankle Sprain/Fracture.
  - F) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
  - G) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
  - H) Other therapies in Section F., Therapeutic Procedures, Non-operative, may be employed in individual cases.
- vi. **Surgical Indications/Considerations:** Surgery is indicated for unstable peritrochanteric fractures and femoral neck fractures.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.
- vii. **Operative Procedures:** Prosthetic replacement for displaced femoral neck fractures. Reduction and internal fixation for peritrochanteric fractures, and un-displaced, or minimally-displaced neck fractures.
- viii. **Post-operative Treatment:**

- A) Anti coagulant therapy to prevent deep venous thrombosis. Refer Section F., Therapeutic Procedures, Non-operative.
- B) Treatment usually includes active therapy with or without passive therapy.
- C) An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F., Therapeutic Procedures, Non-operative.
- D) Treatment should include gait training with appropriate assistive devices.
- E) Therapy should include training on the use of adaptive equipment and home and work site evaluation when appropriate.
- F) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

**h. Impingement/Labral Tears:**

- i. **Description/Definition:** Two types of impingement are described pincer; resulting from over coverage of the acetabulum and/or cam; resulting from aspherical portion of the head and neck junction. Persistence of these abnormalities can cause early arthritis or labral tears. Labral tears can also be isolated; however, they are frequently accompanied by bony abnormalities. Patients usually complain of catching or painful clicking which should be distinguished from a snapping iliopsoas tibial tendon. A pinch while sitting may be reported and hip or groin pain.
- ii. **Occupational Relationship:** Impingement abnormalities are usually congenital; however, they may be aggravated by repetitive rotational force or trauma. Labral tears may accompany impingement or result from high energy trauma.
- iii. **Specific Physical Exam Findings:** Positive labral tests.
- iv. **Diagnostic Testing Procedures:** Cross table laterals, standing AP pelvis and frog leg lateral x-rays. MRI may reveal abnormality; however, false positives and false negatives are also possible. MRI arthrogram with gadolinium should be performed to diagnose labral tears, not a pelvic MRI. Intra-articular injection should help rule out extra-articular pain generators. To confirm the diagnosis, the patient should demonstrate changes on a pain scale accompanied by recorded functional improvement post-injection. This is important, as labral tears do not always cause pain and over-diagnosis is possible using imaging alone.
- v. **Non-operative Treatment Procedures:**

- A) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
- B) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, reducing hip adduction and internal rotation home exercise, joint protection, and weight management.
- C) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies and a home exercise program. Active therapies include proprioception training, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by proximal and distal structures. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative.

- D) Steroid Injections - Steroid injections may decrease inflammation and allow the therapist to progress with functional exercise and ROM.

- ❖ Time to Produce Effect: One injection.
- ❖ Maximum Duration: 3 injections in one year spaced at least 4 to 8 weeks apart.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose levels at least daily for 2 weeks after injections.

- E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- F) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

**vi. Surgical Indications/Considerations:**

- A) Surgery is indicated when 1) functional limitations persist after 8 weeks of active patient participation in treatment, 2) there are clinical signs and symptoms suggestive of the diagnosis and 3) other diagnoses have been ruled out.

- B) Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.
- C) In cases where surgery is contraindicated due to obesity, it may be appropriate to recommend a weight loss program if the patient is unsuccessful losing weight on their own. Coverage for weight loss would continue only for motivated patients who have demonstrated continual progress with weight loss.
- D) Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

vii. **Operative Procedures:** Debridement or repair of labrum and removal of excessive bone.

viii. **Post-operative Treatment:**

- A) When bone is removed and/or the labrum is repaired, weight-bearing restrictions usually apply.
- B) An individualized rehabilitation program based upon communication between the surgeon and the therapist that should include gait training with appropriate assistive devices. Refer to Section F., Therapeutic Procedures Non-operative.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

i. **Pelvic Fracture:**

- i. **Description/Definition:** Fracture of one or more components of the pelvic ring (sacrum and iliac wings).
- ii. **Occupational Relationship:** Usually from a traumatic injury such as a fall or crush.
- iii. **Specific Physical Exam Findings:** Displaced fractures may cause pelvic deformity and shortening, or rotation of the lower extremities.
- iv. **Diagnostic Testing Procedures:** Radiographs, CT scanning. Occasionally MRI, angiogram, urethrogram, emergent sonogram.
- v. **Non-operative Treatment Procedures:**

- A) Initial Treatment: Protected weight-bearing. Although surgery is usually required, non-operative procedures may be considered in a stable, non-displaced fracture.
- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Refer to comments related to osteoporosis in Section F. 7. h. Therapeutic Procedures, Non-operative, Osteoporosis Management.
- E) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
- F) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions, after bony union has been achieved. They should include bracing then range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include, proprioception training, gait training with appropriate assistive devices, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by proximal and distal structures. Therapy should include training on the use of adaptive equipment and home and work site evaluations when appropriate. Refer to Section F., Therapeutic Procedures, Non-operative.

Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative.

- G) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- H) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations**: Unstable fracture pattern, or open fracture.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that insurers cover a smoking cessation

program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

vii. **Operative Procedures:** External or internal fixation dictated by fracture pattern.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section F., Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) Treatment usually includes active therapy with or without passive therapy for gait, pelvic stability, strengthening, and restoration of joint and extremity function. Treatment should include gait training with appropriate assistive devices.
- C) Graduated weight-bearing according to fracture healing.
- D) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

j. **Tendonopathy:** Refer to Section E. 2. k., Tendonopathy for general recommendations.

k. **Tibial Fracture:**

i. **Description/Definition:** Fracture of the tibia proximal to the malleoli.

Open tibial fractures are graded in severity according to the Gustilo-Anderson Classification:

- **Type I:** Less than 1 cm (puncture wounds).
- **Type II:** 1 to 10 cm.
- **Type III-A:** Greater than 10 cm, sufficient soft tissue preserved to cover the wound (includes gunshot wounds and any injury in a contaminated environment).
- **TYPE III-B:** Greater than 10 cm, requiring a soft tissue coverage procedure.
- **TYPE III-C:** With vascular injury requiring repair.

ii. **Occupational Relationship:** Usually from a traumatic injury such as a fall or crush.

iii. **Specific Physical Exam Findings:** May have a short, abnormally rotated extremity. Effusion if the knee joint involved.

iv. **Diagnostic Testing Procedures:** Radiographs. CT scanning or MRI.

v. **Non-operative Treatment Procedures:**

- A) **Initial Treatment:** Protected weight-bearing; functional bracing. There is some evidence for use of pneumatic braces with stress fractures.
- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Refer to comments related to osteoporosis in Section F. 7. h. Therapeutic Procedures, Non-operative, Osteoporosis Management.
- E) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
- F) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions, after bony union has been achieved. They should include bracing then range-of-motion (ROM), active therapies including proprioception training, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures, and a home exercise program. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, restoring normal joint mechanics, influenced by proximal and distal structures. Therapy should include training on the use of adaptive equipment and home and work site evaluations when appropriate. Bracing may be appropriate. Refer to Section F., Therapeutic Procedures, Non-operative.  
  
Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative.
- G) Orthotics such as heel lifts and custom shoe build-ups may be required when leg-length discrepancy persists.
- H) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- I) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

- vi. **Surgical Indications/Considerations:** Unstable fracture pattern, displaced fracture (especially if the knee joint is involved), open fracture, and non-union.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

- vii. **Operative Procedures:** Often closed rodding for shaft fractures. Open reduction and internal fixation more common for fractures involving the knee joint or pilon fractures of the distal tibia.

Human bone morphogenetic protein (RhBMP): this material is used for surgical repair of open tibial fractures. Refer to Section G, Therapeutic Procedures, Operative for further specific information.

Stem cell use - stem cells have been added to allograft to increase fracture union. Their use is considered experimental and is not recommended at this time.

- viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F., Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) Treatment may include protected weight-bearing and active therapy with or without passive therapy for early range of motion if joint involvement.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

- I. **Trochanteric Fracture:**

- i. **Description/Definition:** Fracture of the greater trochanter of the proximal femur.
- ii. **Occupational Relationship:** Usually from a traumatic injury such as a fall or crush.
- iii. **Specific Physical Exam Findings:** Local tenderness over the greater trochanter. Sometimes associated swelling, ecchymosis.
- iv. **Diagnostic Testing Procedures:** Radiographs, CT scans or MRI.
- v. **Non-operative Treatment Procedures:**

- A) **Initial Treatment:** protected weight-bearing.

- B) Medications such as analgesics and anti-inflammatories may be helpful. Refer to medication discussions in Section F. 7, Medications and Medical Management.
- C) Patient education should include instruction in self-management techniques, ergonomics, body mechanics, home exercise, joint protection, and weight management.
- D) Refer to comments related to osteoporosis in Section F. 7. h. Therapeutic Procedures, Non-operative, Osteoporosis Management.
- E) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
- F) Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions, after bony union has been achieved. They should include bracing then range-of-motion (ROM), active therapies, and a home exercise program. Active therapies include proprioception training, restoring normal joint mechanics, and clearing dysfunctions from adjacent structures, and a home exercise program. Passive as well as active therapies may be used for control of pain and swelling. Therapy should progress to strengthening and an independent home exercise program targeted to further improve ROM, strength, and normal joint mechanics influenced by proximal and distal structures. Bracing may be appropriate. Refer to Section F., Therapeutic Procedures, Non-operative.  
  
Passive modalities are most effective as adjunctive treatments to improve the results of active treatment. They may be used as found as adjunctive in Section F., Therapeutic Procedures, Non-operative.
- G) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 13, Return to Work.
- H) Other therapies in Section F. Therapeutic Procedures, Non-operative may be employed in individual cases.

vi. **Surgical Indications/Considerations:** Large, displaced fragment, open fracture.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

vii. **Operative Procedures:** Open reduction, internal fixation.

viii. **Post-operative Treatment:**

- A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using therapies as outlined in Section F., Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- B) Protected weight-bearing is usually needed. Full weight-bearing with radiographic and clinical signs of healing.
- C) Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

## F. THERAPEUTIC PROCEDURES — NON-OPERATIVE

Treating providers, as well as employers and insurers are highly encouraged to reference the General Guidelines Principles (Section B) prior to initiation of any therapeutic procedure. Before initiation of any therapeutic procedure, the authorized treating provider, employer and insurer must consider these important issues in the care of the injured worker.

First, patients undergoing therapeutic procedure(s) should be released or returned to modified, restricted duty during their rehabilitation at the earliest appropriate time. Refer to F. 13, Return-to-Work in this section for detailed information.

Second, cessation and/or review of treatment modalities should be undertaken when no further significant subjective or objective improvement in the patient's condition is noted. If patients are not responding within the recommended duration periods, alternative treatment interventions, further diagnostic studies or consultations should be pursued.

Third, providers should provide and document education to the patient. No treatment plan is complete without addressing issues of individual and/or group patient education as a means of facilitating self-management of symptoms.

Lastly, formal psychological or psychosocial evaluation should be performed on patients not making expected progress within 6 to 12 weeks following injury and whose subjective symptoms do not correlate with objective signs and tests.

In cases where a patient is unable to attend an outpatient center, home therapy may be necessary. Home therapy may include active and passive therapeutic procedures as well as other modalities to assist in alleviating pain, swelling, and abnormal muscle tone. Home therapy is usually of short duration and continues until the patient is able to tolerate coming to an outpatient center.

The following procedures are listed in alphabetical order.

1. **ACUPUNCTURE** is an accepted and widely used procedure for the relief of pain and inflammation in the lower extremity. There is some scientific evidence to support its use for hip and knee osteoarthritis. The exact mode of action is only partially understood. Western medicine studies suggest that acupuncture stimulates the nervous system at the level of the brain, promotes deep relaxation, and affects the release of neurotransmitters. Acupuncture is commonly used as an alternative or in addition to traditional Western pharmaceuticals. While it is commonly used when pain medication is reduced or not tolerated, it may be used as an adjunct to physical rehabilitation and/or surgical intervention to hasten the return of functional activity. Acupuncture should be performed by licensed practitioners.
  - a. **Acupuncture:** is the insertion and removal of filiform needles to stimulate acupoints (acupuncture points). Needles may be inserted, manipulated and retained for a period of time. Acupuncture can be used to reduce pain, reduce inflammation, increase blood flow, increase range-of-motion, decrease the side effect of medication-induced nausea, promote relaxation in an anxious patient, and reduce muscle spasm.

Indications include joint pain, joint stiffness, soft tissue pain and inflammation, paresthesia, post-surgical pain relief, muscle spasm, and scar tissue pain.

- b. **Acupuncture with Electrical Stimulation:** is the use of electrical current (micro-amperage or milli-amperage) on the needles at the acupuncture site. It is used to increase effectiveness of the needles by continuous stimulation of the acupoint. Physiological effects (depending on location and settings) can include endorphin release for pain relief, reduction of inflammation, increased blood circulation, analgesia through interruption of pain stimulus, and muscle relaxation.

It is indicated to treat chronic pain conditions, radiating pain along a nerve pathway, muscle spasm, inflammation, scar tissue pain, and pain located in multiple sites.

- c. **Total Time Frames for Acupuncture and Acupuncture with Electrical Stimulation:** Time frames are not meant to be applied to each of the above sections separately. The time frames are to be applied to all acupuncture treatments regardless of the type or combination of therapies being provided.

- ❖ Time to Produce Effect: 3 to 6 treatments.
- ❖ Frequency: 1 to 3 times per week.
- ❖ Optimum Duration: 1 to 2 months.
- ❖ Maximum Duration: 14 treatments.

Any of the above acupuncture treatments may extend longer if objective functional gains can be documented or when symptomatic benefits facilitate progression in the patient's treatment program. Treatment beyond 14 treatments must be documented with respect to need and ability to facilitate positive symptomatic or functional gains. Such care should be re-evaluated and documented with each series of treatments.

- d. **Other Acupuncture Modalities:** Acupuncture treatment is based on individual patient needs and therefore treatment may include a combination of procedures to enhance treatment effect. Other procedures may include the use of heat, soft tissue manipulation/massage, and exercise. Refer to Active Therapy (Therapeutic Exercise) and Passive Therapy sections (Massage and Superficial Heat and Cold Therapy) for a description of these adjunctive acupuncture modalities and time frames.

2. **BIOFEEDBACK** is a form of behavioral medicine that helps patients learn self-awareness and self-regulation skills for the purpose of gaining greater control of their physiology, such as muscle activity, brain waves, and measures of autonomic nervous system activity. Electronic instrumentation is used to monitor the targeted physiology and then displayed or fed back to the patient visually, auditorially, or tactilely, with coaching by a biofeedback specialist. Biofeedback is provided by clinicians certified in biofeedback and/or who have documented specialized education, advanced training, or direct or supervised experience qualifying them to provide the specialized treatment needed (e.g., surface EMG, EEG, or other).

Treatment is individualized to the patient's work-related diagnosis and needs. Home practice of skills is required for mastery and may be facilitated by the use of home training tapes. The ultimate goal in biofeedback treatment is normalizing the physiology to the pre-injury status to the extent possible and involves transfer of learned skills to the

workplace and daily life. Candidates for biofeedback therapy or training must be motivated to learn and practice biofeedback and self-regulation techniques.

Indications for biofeedback include individuals who are suffering from musculoskeletal injury in which muscle dysfunction or other physiological indicators of excessive or prolonged stress response affects and/or delays recovery. Other applications include training to improve self-management of emotional stress/pain responses such as anxiety, depression, anger, sleep disturbance, and other central and autonomic nervous system imbalances. Biofeedback is often utilized along with other treatment modalities.

- ❖ Time to Produce Effect: 3 to 4 sessions.
- ❖ Frequency: 1 to 2 times per week.
- ❖ Optimum Duration: 5 to 6 sessions.
- ❖ Maximum Duration: 10 to 12 sessions. Treatment beyond 12 sessions must be documented with respect to need, expectation, and ability to facilitate functional gains.

### 3. **BONE-GROWTH STIMULATORS**

- a. **Electrical:** Pre-clinical and experimental literature has shown a stimulatory effect of externally applied electrical fields on the proliferation and calcification of osteoblasts and periosteal cells. All of the studies on bone growth stimulators, however, have some methodological deficiencies and high-quality literature of electrical bone growth stimulation is lacking for lower extremity injuries.

These acceptable nonsurgical techniques include Capacitive Coupling (CC), which places skin electrodes on opposite sides of the bone being treated and Pulsed Electromagnetic Field (PEMF) which uses a current-carrying coil which induces a secondary electrical field in bone.

There is insufficient evidence to conclude a benefit of electrical stimulation for delayed union, non-union, long bone fracture healing, fresh fractures, or tibial stress fractures.

- b. **Low-intensity Pulsed Ultrasound:** There is some evidence that low-intensity pulsed ultrasound, applied by the patient at home and administered as initial treatment of the fracture, reduces the time required for cortical bridging in tibial fractures. Non-union and delayed unions were not included in these clinical trials. Possible indications for Low-Intensity Pulsed Ultrasound are non-unions or fractures that are expected to require longer healing time.

FDA approved bone-growth stimulators of any type may be appropriate for patients with non-union after initial fracture care or for patients with acute fractures or osteotomies who are at high risk for delayed union or non-union. Patients at high risk include, but are not limited to, smokers, diabetics, and those on chemotherapeutic agents or other long-term medication affecting bone growth. Due to lack of supporting scientific evidence, stimulators require prior authorization.

### 4. **EXTRACORPOREAL SHOCK WAVE THERAPY (ESWT)**

Extracorporeal shock wave therapy (ESWT) delivers an externally applied acoustic pulse to the plantar fascia. It has been hypothesized that ESWT causes microtrauma to the fascia, inducing a repair process involving the formation of new blood vessels and delivery of nutrients to the affected area. High energy ESWT is delivered in one session and may be painful requiring some form of anesthesia. It is not generally recommended for the treatment of plantar heel pain due to increased cost when it is performed with conscious sedation. It may also be performed with local blocks. Low energy ESWT does not require anesthetics. It is given in a series of treatments, generally three sessions.

There is conflicting evidence concerning low energy ESWT for plantar heel pain. Focused ESWT concentrates the acoustic pulse on a single point in the heel, while radial ESWT distributes the pulse along the entire plantar fascia. Focused low energy ESWT has not been shown to produce clinically important reductions in plantar heel pain. There is some evidence that radial ESWT may reduce plantar pain more effectively than placebo, but a successful response may occur in only 60% of patients. There is some evidence supporting high-energy ESWT.

Low energy radial or high energy ESWT with local blocks are accepted treatments. It should only be used on patients who have had plantar pain for 4 months or more; have tried NSAIDs, ice, stretching exercises, shoe inserts; and have significant functional deficits. These patients should meet the indications for surgery found in Section E, heel spurs, plantar fascia pain. Tarsal tunnel syndrome should be ruled out. Peripheral vascular disease, lower extremity neuropathy and diabetes are all relative contraindications. Diagnostic testing may be needed to rule out these conditions.

- ❖ Time to Effect: 2 sessions.
- ❖ Optimum Duration: 3 sessions one week or more apart.
- ❖ Maximum Duration: Treatment may be continued for up to 5 total sessions if functional improvement has been demonstrated after three treatment sessions. Functional improvement is preferably demonstrated using direct testing or functional scales validated in clinical research settings.

## **5. INJECTIONS-THERAPEUTIC**

Description — Therapeutic injection procedures may play a significant role in the treatment of patients with lower extremity pain or pathology. Therapeutic injections involve the delivery of anesthetic and/or anti-inflammatory medications to the painful structure. Therapeutic injections have many potential benefits. Ideally, a therapeutic injection will: (a) reduce inflammation in a specific target area; (b) relieve secondary muscle spasm; (c) allow a break from pain; and (d) support therapy directed to functional recovery. Diagnostic and therapeutic injections should be used early and selectively to establish a diagnosis and support rehabilitation. If injections are overused or used outside the context of a monitored rehabilitation program, they may be of significantly less value.

Indications — Diagnostic injections are procedures which may be used to identify pain generators or pathology. For additional specific clinical indications, see Section E, Specific Lower Extremity Injury Diagnosis, Testing and Treatment.

Special Considerations — The use of injections has become progressively sophisticated. Each procedure considered has an inherent risk, and risk versus benefit should be

evaluated when considering injection therapy. In addition, all injections must include sterile technique.

Contraindications — General contraindications include local or systemic infection, bleeding disorders, allergy to medications used, and patient refusal. Specific contraindications may apply to individual injections.

a. **Joint Injections:** are generally accepted, well-established procedures that can be performed as analgesic or anti-inflammatory procedures.

- ❖ Time to Produce Effect: Immediate with local anesthesia, or within 3 days if no anesthesia.
- ❖ Optimum Duration: Usually one to two injections is adequate.
- ❖ Maximum Duration: Not more than three to four times annually.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood-glucose level at least twice daily for two weeks post-injections.

b. **Soft Tissue Injections:** include bursa and tendon insertions. Injections under significant pressure should be avoided as the needle may be penetrating the tendon. Injection into the tendon can cause tendon degeneration, tendon breakdown, or rupture. Injections should be minimized for patients under 30 years of age.

When performing tendon insertion injections, the risk of tendon rupture should be discussed with the patient and the need for restricted duty emphasized.

- ❖ Time to Produce Effect: Immediate with local anesthesia, or within 3 days if no anesthesia.
- ❖ Optimum Duration: Usually one to two injections is adequate.
- ❖ Maximum Duration: Not more than three to four times annually.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood-glucose level at least twice daily for two weeks post-injections.

c. **Trigger Point Injections:** although generally accepted, have only rare indications in the treatment of lower extremity disorders. Therefore, the Division does not recommend their routine use in the treatment of lower extremity injuries.

**Description** - Trigger point treatment can consist of dry needling or injection of local anesthetic with or without corticosteroid into highly localized, extremely sensitive bands of skeletal muscle fibers that produce local and referred pain when activated. Medication is injected in a four-quadrant manner in the area of maximum tenderness. Injection efficacy can be enhanced if injections are immediately followed by myofascial therapeutic interventions, such as vapo-coolant spray and stretch, ischemic pressure massage (myotherapy), specific soft tissue mobilization and physical modalities. There is conflicting evidence regarding the benefit of trigger point injections. A truly blinded study comparing

dry needle treatment of trigger points is not feasible. There is no evidence that injection of medications improves the results of trigger-point injections. Needling alone may account for some of the therapeutic response.

There is no indication for conscious sedation for patients receiving trigger point injections. The patient must be alert to help identify the site of the injection.

Indications - Trigger point injections may be used to relieve myofascial pain and facilitate active therapy and stretching of the affected areas. They are to be used as an adjunctive treatment in combination with other treatment modalities such as functional restoration programs. Trigger point injections should be utilized primarily for the purpose of facilitating functional progress. Patients should continue with a therapeutic exercise program as tolerated throughout the time period they are undergoing intensive myofascial interventions. Myofascial pain is often associated with other underlying structural problems, and any abnormalities need to be ruled out prior to injection.

Trigger point injections are indicated in those patients where well circumscribed trigger points have been consistently observed, demonstrating a local twitch response, characteristic radiation of pain pattern and local autonomic reaction, such as persistent hyperemia following palpation. Generally, these injections are not necessary unless consistently observed trigger points are not responding to specific, noninvasive, myofascial interventions within approximately a 6 week time frame.

Complications — Potential but rare complications of trigger point injections include infection, anaphylaxis, neurapraxia, and neuropathy. If corticosteroids are injected in addition to local anesthetic, there is a risk of developing local myopathy. Severe pain on injection suggests the possibility of an intraneural injection, and the needle should be immediately repositioned.

- ❖ Time to Produce Effect: Local anesthetic 30 minutes; no anesthesia 24 to 48 hours.
- ❖ Frequency: Weekly, suggest no more than 4 injection sites per session per week to avoid significant post-injection soreness.
- ❖ Optimum Duration: 4 Weeks.
- ❖ Maximum Duration: 8 weeks. Occasional patients may require 2 to 4 repetitions of trigger point injection series over a 1 to 2 year period.

- d. **Viscosupplementation/Intracapsular Acid Salts:** is an accepted form of treatment for osteoarthritis or degenerative changes in the knee joint. There is good evidence that intra-articular hyaluronic acid injections have only a small effect on knee pain and function. Therefore, the patient and treating physician should identify functional goals and the likelihood of achieving improved ability to perform activities of daily living or work activities with injections versus other treatments. The patient should agree to comply with the treatment plan including home exercise. These injections may be considered an alternative in patients who have failed non-operative treatment and surgery is not an option, particularly, if non-steroidal anti-inflammatory drug treatment is contraindicated or has been unsuccessful. Viscosupplementation is not recommended for patients with severe osteoarthritis who are surgical candidates. Its efficacy beyond 6

months is not well-established. There is no evidence that one product significantly outperforms another, prior authorization is required to approve product choice and for repeat series of injections.

One injection of 6 ml of Hylan G-F 20 may be effective and is an option for knee injections.

Viscosupplementation is not recommended for ankle osteoarthritis due to the small effect size documented in knee conditions and the lack of evidence supporting its use in the ankle. Viscosupplementation is not recommended for hip arthritis given the probable superiority of corticosteroid injections. In rare cases a patient with significant hip osteoarthritis who does not qualify for surgical intervention may try viscosupplementation. It should be done with ultrasound or fluoroscopic guidance and will not necessarily require a series of three injections. The patient may choose to have repeat injections when the first injection was successful.

- ❖ Time to Produce Effect: After 1 series or one injection as discussed above, there must be a functional gain lasting three months to justify repeat injections.
- ❖ Frequency: One injection or 1 series (3 to 5 injections generally spaced 1 week apart).
- ❖ Optimum/Maximum Duration: Varies. Efficacy beyond 6 months is not well-established.

- e. **Prolotherapy:** (also known as sclerotherapy) consists of peri-articular injections of hypertonic dextrose with or without phenol with the goal of inducing an inflammatory response that will recruit cytokine growth factors involved in the proliferation of connective tissue. Advocates of prolotherapy propose that these injections will alleviate complaints related to joint laxity by promoting the growth of connective tissue and stabilizing the involved joint.

Laboratory studies may lend some biological plausibility to claims of connective tissue growth, but high quality published clinical studies are lacking. The dependence of the therapeutic effect on the inflammatory response is poorly defined, raising concerns about the use of conventional anti-inflammatory drugs when proliferant injections are given. The evidence in support of prolotherapy is insufficient and therefore, its use is not recommended in lower extremity injuries.

6. **JOBSITE ALTERATION** Early evaluation and training of body mechanics are essential for every injured worker. Risk factors to be addressed include: repetitive work, lifting, and forces that have an impact on the lower extremity. In some cases, this requires a jobsite evaluation. There is no single factor or combination of factors that is proven to prevent or ameliorate lower extremity pain, but a combination of ergonomic and psychosocial factors are generally considered to be important. Physical factors that may be considered include use of force, repetitive work, squatting, climbing, kneeling, crouching, crawling, prolonged standing, walking a distance or on uneven surfaces, jumping, running, awkward positions requiring use of force, and lower extremity vibration. Psychosocial factors to be considered include pacing, degree of control over job duties, perception of job stress, and supervisory support.

The job analysis and modification should include input from the employee, employer, and a medical professional familiar with work place evaluation. An ergonomist may also provide useful information. The employee must be observed performing all job functions in order for the jobsite analysis to be valid. Periodic follow-up is recommended to evaluate effectiveness of the intervention and need for additional ergonomic changes.

- a. **Ergonomic Changes:** may be made to modify the hazards identified. In addition, workers should be counseled to vary tasks throughout the day. When possible, employees performing repetitive tasks should take 15 to 30 second breaks every 10 to 20 minutes, or 5-minute breaks every hour. Mini-breaks should include stretching exercises.
- b. **Interventions:** should consider engineering controls (e.g., mechanizing the task, changing the tool used, or adjusting the jobsite), or administrative controls (e.g., adjusting the time an individual performs the task).

7. **MEDICATIONS AND MEDICAL MANAGEMENT** Use of medications will vary widely due to the spectrum of injuries from simple strains to complicated fractures. A thorough medication history, including use of alternative and over-the-counter medications, should be performed at the time of the initial visit and updated periodically. Treatment for pain control is initially accomplished with acetaminophen and/or NSAIDs. The patient should be educated regarding the interaction with prescription and over-the-counter medications as well as the contents of over-the-counter herbal products.

Nonsteroidal anti-inflammatory drugs (NSAIDs) and acetaminophen are useful in the treatment of injuries associated with degenerative joint disease and/or inflammation. These same medications can be used for pain control.

Topical agents can be beneficial for pain management in lower extremity injuries. This includes topical capsaicin, nonsteroidals, as well as topical iontophoresis/phonophoresis, such as steroid creams and lidocaine.

Glucosamine and chondroitin are sold in the United States as dietary supplements. Their dosage, manufacture, and purity are not regulated by the Food and Drug Administration. For moderate to severe knee osteoarthritis, there is good evidence for the effectiveness of a pharmaceutical grade combination of 500 mg glucosamine hydrochloride and 400 mg chondroitin sulfate three times per day. Effectiveness for mild disease is unknown. Recent literature suggests that chondroitin sulfate in a dose of 800 mg once daily may reduce the rate of joint degradation as demonstrated by joint space loss on serial x-rays.

For mild-to-moderate osteoarthritis confined to the hip, there is good evidence that a pharmaceutical-grade glucosamine sulfate is unlikely to produce a clinically significant improvement in pain and joint function.

When osteoarthritis is identified as a contributing factor to a work-related injury, pharmaceutical grade glucosamine and chondroitin may be tried. Long-term coverage for these medications would fall under Workers' Compensation only when the arthritic condition is primarily related to the work injury.

S-adenosyl methionine (SAM-e), like glucosamine and chondroitin, is sold as a dietary supplement in the United States, with a similar lack of standard preparations of dose and manufacture. There is some evidence that a pharmaceutical-grade SAM-e is as effective as celecoxib in improving pain and function in knee osteoarthritis, but its onset of action is slower. Studies using liquid chromatography have shown that it may lose its potency after

several weeks of storage. In addition, SAM-e has multiple additional systemic effects. It is not currently recommended due to lack of availability of pharmaceutical quality, systemic effects, and loss of potency with storage.

The following are listed in alphabetical order.

a. **Acetaminophen:** is an effective analgesic with antipyretic but not anti-inflammatory activity. Acetaminophen is generally well tolerated, causes little or no gastrointestinal irritation and is not associated with ulcer formation. Acetaminophen has been associated with liver toxicity in overdose situations or in chronic alcohol use. Patients may not realize that many over-the-counter preparations may contain acetaminophen. The total daily dose of acetaminophen is recommended not to exceed 4 grams per 24-hour period, from all sources, including narcotic-acetaminophen combination preparations.

❖ Optimal Duration: 7 to 10 days.

❖ Maximum Duration: Chronic use as indicated on a case-by-case basis. Use of this substance long-term for 3 days per week or greater may be associated with rebound pain upon cessation.

b. **Bisphosphonates:** may be used for those qualifying under osteoporosis guidelines. Long-term use for the purpose of increasing prosthetic fixation is not recommended as long-term improvement in fixation is not expected. See Section 7, h., Osteoporosis Management Section below.

c. **Deep Venous Thrombosis Prophylaxis:** is a complex issue involving many variables such as individual patient characteristics, the type of surgery, anesthesia used and agent(s) used for prophylaxis. Final decisions regarding prophylaxis will depend on the surgeon's clinical judgment. The following are provided as generally accepted concepts regarding prophylaxis at the time of writing of these guidelines.

All patients undergoing lower extremity surgery or prolonged lower extremity immobilization should be evaluated for elevated risk for DVT and should receive education on prevention. Possible symptoms should be discussed. Patients at higher risk than the normal population include, but are not limited to, those with known hypercoagulable states and those with previous pulmonary embolism or DVT. Those considered at higher risk for bleeding, which may alter thromboprophylaxis protocols, include patients with a history of a bleeding disorder, recent gastrointestinal bleed, or hemorrhagic stroke.

There is no evidence to support mandatory prophylaxis for all patients who are immobilized or undergo lower extremity procedures, outside of hip or knee arthroplasties or hip fracture repair.

Hip and knee arthroplasties and hip fracture repair are standard risk factors requiring thromboprophylaxis. Commonly used agents are low molecular weight heparin, low dose un-fractionated heparin (LDUH), synthetic pentasaccharide fondaparinux, or warfarin. If aspirin is used, it should be accompanied by aggressive mechanical prophylaxis.

All patients should be mobilized as soon as possible after surgery. Mechanical prophylaxis such as pneumatic devices that are thigh calf, calf only, or foot

pumps may be considered immediately post-operatively and/or until the patient is discharged home. Thigh length or knee high graduated compression stockings are used for most patients. With prolonged prophylaxis, lab tests must be drawn regularly. These may be accomplished with home health care or outpatient laboratories when appropriate.

- d. **Minor Tranquilizer/Muscle Relaxants:** are appropriate for muscle spasm, mild pain and sleep disorders. When prescribing these agents, physicians must seriously consider side effects of drowsiness or dizziness and the fact that benzodiazepines may be habit-forming.

- ❖ Optimal Duration: 1 week.

- ❖ Maximum Duration: 4 weeks.

- e. **Narcotics:** should be primarily reserved for the treatment of severe lower extremity pain. There are circumstances where prolonged use of narcotics is justified based upon specific diagnosis, and in these cases, it should be documented and justified. In mild-to-moderate cases of lower extremity pain, narcotic medication should be used cautiously on a case-by-case basis. Adverse effects include respiratory depression, the development of physical and psychological dependence, and impaired alertness.

Narcotic medications should be prescribed with strict time, quantity, and duration guidelines, and with definitive cessation parameters. Pain is subjective in nature and should be evaluated using a pain scale and assessment of function to rate effectiveness of the narcotic prescribed. Any use beyond the maximum duration should be documented and justified based on the diagnosis and/or invasive procedures.

- ❖ Optimal Duration: 3 to 7 days.

- ❖ Maximum Duration: 2 weeks. Use beyond two weeks is acceptable in appropriate cases. Refer to Chronic Pain Guidelines which gives a detailed discussion regarding medication use in chronic pain management. When prescribing beyond the maximum duration, it is recommended physicians access the Colorado PDMP (Prescription Drug Monitoring Program). This system allows the prescribing physician to see all controlled substances prescribed by other physicians for an individual patient.

- f. **Nonsteroidal Anti-Inflammatory Drugs (NSAIDs):** are useful for pain and inflammation. In mild cases, they may be the only drugs required for analgesia. There are several classes of NSAIDs, and the response of the individual injured worker to a specific medication is unpredictable. For this reason, a range of NSAIDs may be tried in each case with the most effective preparation being continued. Patients should be closely monitored for adverse reactions. The US Food and Drug Administration advise that many NSAIDs may cause an increased risk of serious cardiovascular thrombotic events, myocardial infarction, and stroke, which can be fatal. Naproxen sodium does not appear to be associated with increased risk of vascular events. Administration of proton pump inhibitors, histamine 2 blockers, or prostaglandin analog misoprostol along with these NSAIDs may reduce the risk of duodenal and gastric ulceration but do not impact possible cardiovascular complications. Due to the cross-reactivity

between aspirin and NSAIDs, NSAIDs should not be used in aspirin-sensitive patients, and should be used with caution in all asthma patients. NSAIDs are associated with abnormal renal function, including renal failure, as well as, abnormal liver function. Certain NSAIDs may have interactions with various other medications. Individuals may have adverse events not listed above. Intervals for metabolic screening are dependent upon the patient's age, general health status and should be within parameters listed for each specific medication. Complete Blood Count (CBC) and liver and renal function should be monitored at least every six months in patients on chronic NSAIDs and initially when indicated.

NSAIDs may be used for pain management after joint replacement. They have also been used to reduce heterotopic ossification after arthroplasty. NSAIDs do reduce the radiographically documented heterotopic ossification in this setting, but there is some evidence that they do not improve functional outcomes and they may increase the risk of bleeding events in the post-operative period. Their routine use for prevention of heterotopic bone formation is not recommended.

i. Non-selective Nonsteroidal Anti-Inflammatory Drugs:

Includes NSAIDs and acetylsalicylic acid (aspirin). Serious GI toxicity, such as bleeding, perforation, and ulceration can occur at any time, with or without warning symptoms in patients treated with traditional NSAIDs. Physicians should inform patients about the signs and/or symptoms of serious gastrointestinal toxicity and what steps to take if they occur. Anaphylactoid reactions may occur in patients taking NSAIDs. NSAIDs may interfere with platelet function. Fluid retention and edema have been observed in some patients taking NSAIDs.

- ❖ Optimal Duration: 1 week.

- ❖ Maximum Duration: 1 year. Use of these substances long-term (3 days per week or greater) is associated with rebound pain upon cessation.

ii. Selective Cyclo-oxygenase-2 (COX-2) Inhibitors:

COX-2 inhibitors are more recent NSAIDs and differ in adverse side effect profiles from the traditional NSAIDs. The major advantages of selective COX-2 inhibitors over traditional NSAIDs are that they have less gastrointestinal toxicity and no platelet effects. COX-2 inhibitors can worsen renal function in patients with renal insufficiency, thus renal function may need monitoring.

COX-2 inhibitors should not be first-line for low risk patients who will be using a NSAID short-term but are indicated in select patients for whom traditional NSAIDs are not tolerated. Serious upper GI adverse events can occur even in asymptomatic patients. Patients at high risk for GI bleed include those who use alcohol, smoke, are older than 65, take corticosteroids or anti-coagulants, or have a longer duration of therapy. Celecoxib is contraindicated in sulfonamide allergic patients.

- ❖ Optimal Duration: 7 to 10 days.

- ❖ Maximum Duration: Chronic use is appropriate in individual cases. Use of these substances long-term (3 days per week or greater) is associated with rebound pain upon cessation.

g. **Oral Steroids:** have limited use but are accepted in cases requiring potent anti-inflammatory drug effect in carefully selected patients. A one-week regime of steroids may be considered in the treatment of patients who have arthritic flare-ups with significant inflammation of the joint. The physician must be fully aware of potential contraindications for the use of all steroids such as hypertension, diabetes, glaucoma, peptic ulcer disease, etc., which should be discussed with the patient.

- ❖ Optimal Duration: 3 to 7 days.

- ❖ Maximum Duration: 7 days.

h. **Osteoporosis Management:**

All patients with conditions which require bone healing, especially those over 50, should be encouraged to ingest at least 1200 mg of Calcium and 800 IU of Vitamin D per day. There is some evidence that, for women in the older age group (58 to 88) with low hip bone density, greater callus forms for those who adhere to these recommendations than those who do not. Although the clinical implications of this are not known, there is greater non-union in this age group and thus, coverage for these medications during the fracture healing time period is recommended. At this time there is no evidence that bisphosphonates increase acute fracture healing.

Female patients over 65 should be referred for an osteoporosis evaluation if one has not been completed the previous year. Patients who have been on prednisone at a dose of 5 to 7.5 mg for more than 3 months should be evaluated for glucocorticoid induced osteoporosis. An osteoporosis evaluation may be considered for males who: are over 70, are physically inactive, have previous fragility fracture, have a BMI less than 20, or have been hypogonadal for 5 years. Evaluation may also be considered for patients on medications that can cause bone loss, patients who have suffered a fracture due to a low-impact fall or with minimum to no provocation, and women under 65 with one of the following: menopause before 40, current smoker, or body mass index less than 20. Low body weight appears to be the best predictor of osteoporosis in women younger than 65. In one adequate study, all patients aged 50 to 75 referred to an orthopaedic department for treatment of wrist, vertebral, proximal humerus, or hip fractures received bone mass density testing. 97% of patients had either osteoporosis (45%) or osteopenia (42%). Referral is important to prevent future fractures in these groups. Long-term care for osteoporosis is not covered under workers compensation even though it may be discovered due to an injury-related acute fracture.

i. **Psychotropic/Anti-anxiety/Hypnotic Agents:** may be useful for treatment of mild and chronic pain, dysesthesias, sleep disorders, and depression. Post-operative patients may receive medication to assure normal sleep cycles. Antidepressant medications, such as tricyclics and Selective Serotonin Reuptake Inhibitors (SSRIs), are useful for affective disorder and chronic pain management. Tricyclic antidepressant agents, in low dose, are useful for chronic pain but have more frequent side effects.

Anti-anxiety medications are best used for short-term treatment (i.e., less than 6 months). Accompanying sleep disorders are best treated with sedating antidepressants prior to bedtime. Frequently, combinations of the above agents are useful. As a general rule, physicians should access the patient's prior history of substance abuse or depression prior to prescribing any of these agents.

Due to the habit-forming potential of the benzodiazepines and other drugs found in this class, they are not routinely recommended. Refer to the Chronic Pain Guidelines which give a detailed discussion regarding medication use in chronic pain management.

- ❖ Optimal Duration: 1 to 6 months.
- ❖ Maximum Duration: 6 to 12 months, with monitoring.

j. **Topical Drug Delivery:** Creams and patches may be an alternative treatment of localized musculoskeletal disorders. It is necessary that all topical agents be used with strict instructions for application as well as the maximum number of applications per day to obtain the desired benefit and avoid potential toxicity. As with all medications, patient selection must be rigorous to select those patients with the highest probability of compliance. Refer to "Iontophoresis" in the F. 15. Passive Therapy of this section for information regarding topical iontophoretic agents.

i. Topical Salicylates and Nonsalicylates: have been shown to be effective in relieving pain in acute and chronic musculoskeletal conditions. Topical salicylate and nonsalicylates achieve tissue levels that are potentially therapeutic, at least with regard to COX inhibition. Other than local skin reactions, the side effects of therapy are minimal, although not non-existent, and the usual contraindications to use of these compounds needs to be considered. Local skin reactions are rare and systemic effects were even less common. Their use in patients receiving warfarin therapy may result in alterations in bleeding time. Overall, the low level of systemic absorption can be advantageous; allowing the topical use of these medications when systemic administration is relatively contraindicated such as is the case in patients with hypertension, cardiac failure, or renal insufficiency.

There is no evidence that topical agents are more or less effective than oral medications.

- ❖ Optimal Duration: 1 week.
- ❖ Maximal Duration: 2 weeks per episode.

ii. Capsaicin: is another medication option for topical drug use in lower extremity injury. Capsaicin offers a safe and effective alternative to systemic NSAID therapy. Although it is quite safe, effective use of capsaicin is limited by the local stinging or burning sensation that typically dissipates with regular use, usually after the first 7 to 10 days of treatment. Patients should be advised to apply the cream on the affected area with a plastic glove or cotton applicator and to avoid inadvertent contact with eyes and mucous membranes.

- ❖ Optimal Duration: 1 week.
- ❖ Maximal Duration: 2 weeks per episode.

iii. Iontophoretic Agents: Refer to “Iontophoresis,” in F. 15 under Passive Therapy of this section.

k. **Tramadol**: is useful in relief of lower extremity pain and has been shown to provide pain relief equivalent to that of commonly prescribed NSAIDs. Tramadol is an atypical opioid with norepinephrine and serotonin reuptake inhibition. It is not considered a controlled substance in the U.S. Although Tramadol may cause impaired alertness, it is generally well tolerated, does not cause gastrointestinal ulceration, or exacerbate hypertension or congestive heart failure. Tramadol should be used cautiously in patients who have a history of seizures or who are taking medication that may lower the seizure threshold, such as MAO inhibitors, SSRIs, and tricyclic antidepressants. This medication has physically addictive properties and withdrawal may follow abrupt discontinuation and is not recommended for patients with prior opioid addiction.

- ❖ Optimal Duration: 3 to 7 days.
- ❖ Maximum Duration: 2 weeks. Use beyond 2 weeks is acceptable in appropriate cases.

## 8. **OCCUPATIONAL REHABILITATION PROGRAMS**

a. **Interdisciplinary**: These generally accepted programs are characterized by a variety of disciplines that participate in the assessment, planning, and/or implementation of an injured workers program with the goal for patients to gain full or optimal function and return-to-work. There should be close interaction and integration among the disciplines to ensure that all members of the team interact to achieve team goals. These programs are for patients with greater levels of disability, dysfunction, de-conditioning and psychological involvement. For patients with chronic pain, refer to the Division’s Chronic Pain Disorder Medical Treatment Guidelines.

i. Work Hardening: is an interdisciplinary program addressing a patient’s employability and return-to-work. It includes a progressive increase in the number of hours per day that a patient completes work simulation tasks until the patient can tolerate a full workday. This is accomplished by addressing the medical, psychological, behavioral, physical, functional, and vocational components of employability and return-to-work.

This can include a highly structured program involving a team approach or can involve any of the components thereof. The interdisciplinary team should, at a minimum, be comprised of a qualified medical director who is board certified with documented training in occupational rehabilitation, team physicians having experience in occupational rehabilitation, occupational therapist, physical therapist, case manager, and psychologist. As appropriate, the team may also include: chiropractor, RN, vocational specialist or certified Biofeedback Therapist.

- ❖ Length of visit: Up to 8 hours each day.

- ❖ Frequency: 2 to 5 visits per week.
- ❖ Optimum Duration: 2 to 4 weeks.
- ❖ Maximum Duration: 6 weeks. Participation in a program beyond six weeks must be documented with respect to need and the ability to facilitate positive symptomatic or functional gains.

b. **Non-Interdisciplinary:** These generally accepted programs are work-related, outcome-focused, individualized treatment programs. Objectives of the program include, but are not limited to, improvement of cardiopulmonary and neuromusculoskeletal functions (strength, endurance, movement, flexibility, stability, and motor control functions), patient education, and symptom relief. The goal is for patients to gain full or optimal function and return to work. The service may include the time-limited use of passive modalities with progression to achieve treatment and/or simulated/real work.

i. **Work Conditioning:** These programs are usually initiated once reconditioning has been completed but may be offered at any time throughout the recovery phase. It should be initiated when imminent return of a patient to modified- or full-duty is not an option, but the prognosis for returning the patient to work at completion of the program is at least fair to good.

- ❖ Length of visit: 1 to 2 hours per day.
- ❖ Frequency: 2 to 5 visits per week.
- ❖ Optimum Duration: 2 to 4 weeks.
- ❖ Maximum Duration: 6 weeks. Participation in a program beyond six weeks must be documented with respect to need and the ability to facilitate positive symptomatic or functional gains.

ii. **Work Simulation:** is a program where an individual completes specific work-related tasks for a particular job and return-to-work. Use of this program is appropriate when modified duty can only be partially accommodated in the work place, when modified duty in the work place is unavailable, or when the patient requires more structured supervision. The need for work place simulation should be based upon the results of a Functional Capacity Evaluation and/or Jobsite Analysis.

- ❖ Length of visit: 2 to 6 hours per day.
- ❖ Frequency: 2 to 5 visits per week.
- ❖ Optimum Duration: 2 to 4 weeks.
- ❖ Maximum Duration: 6 weeks. Participation in a program beyond six weeks must be documented with respect to need and the ability to facilitate positive symptomatic or functional gains.

## 9. **ORTHOTICS AND PROSTHETICS**

a. **Fabrication/Modification of Orthotics:** would be used when there is need to normalize weight-bearing, facilitate better motion response, stabilize a joint with insufficient muscle or proprioceptive/reflex competencies, to protect subacute conditions as needed during movement, and correct biomechanical problems. Footwear modifications may be necessary for work shoes and everyday shoes. Replacement is needed every six months to one year. For specific types of orthotics/prosthetics see Section E, "Specific Lower Extremity Injury Diagnosis, Testing and Treatment."

- ❖ Time to Produce Effect: 1 to 3 sessions (includes wearing schedule and evaluation).
- ❖ Frequency: 1 to 2 times per week.
- ❖ Optimum/Maximum Duration: Over a period of approximately 4 to 6 weeks for casting, fitting, and re-evaluation.

b. **Orthotic/Prosthetic Training:** is the skilled instruction (by qualified providers) in the proper use of orthotic devices and/or prosthetic limbs including stump preparation, donning and doffing limbs, instruction in wearing schedule and orthotic/prosthetic maintenance training. Training can include gait, mobility, transfer and self-care techniques.

- ❖ Time to Produce Effect: 2 to 6 sessions.
- ❖ Frequency: 3 times per week.
- ❖ Optimum/Maximum Duration: 2 to 4 months.

c. **Splints or Adaptive Equipment:** design, fabrication and/or modification indications include the need to control neurological and orthopedic injuries for reduced stress during functional activities and modify tasks through instruction in the use of a device or physical modification of a device, which reduces stress on the injury. Equipment should improve safety and reduce risk of re-injury. This includes high and low technology assistive options such as workplace modifications, crutch or walker training, and self-care aids.

- ❖ Time to Produce Effect: Immediate.
- ❖ Frequency: 1 to 3 sessions or as indicated to establish independent use.
- ❖ Optimum/Maximum Duration: 1 to 3 sessions.

10. **PATIENT EDUCATION** No treatment plan is complete without addressing issues of individual and/or group patient education as a means of prolonging the beneficial effects of treatment, as well as facilitating self-management of symptoms and injury prevention. The patient should be encouraged to take an active role in the establishment of functional outcome goals. They should be educated on their specific injury, assessment findings, and plan of treatment. Instruction on proper body mechanics and posture, positions to avoid, self-care for exacerbation of symptoms, and home exercise should also be addressed.

- ❖ Time to Produce Effect: Varies with individual patient.

- ❖ Frequency: Should occur at each visit.

11. **PERSONALITY/PSYCHOSOCIAL/PSYCHOLOGICAL INTERVENTION** Psychosocial treatment is a generally accepted, widely used and well-established intervention. This group of therapeutic and diagnostic modalities includes, but is not limited to: individual counseling, group therapy, stress management, psychosocial crises intervention, hypnosis and meditation. Any screening or diagnostic workup should clarify and distinguish between pre-existing versus aggravated versus purely causative psychological conditions. Psychosocial intervention is recommended as an important component in the total management program that should be implemented as soon as the problem is identified. This can be used alone or in conjunction with other treatment modalities. Providers treating patients with chronic pain should refer to the Division's Chronic Pain Disorder Medical Treatment Guidelines.

- ❖ Time to Produce Effect: 2 to 4 weeks.
- ❖ Frequency: 1 to 3 times weekly for the first 4 weeks (excluding hospitalization, if required), decreasing to 1 to 2 times per week for the second month. Thereafter, 2 to 4 times monthly.
- ❖ Optimum Duration: 6 weeks to 3 months.
- ❖ Maximum Duration: 3 to 12 months. Counseling is not intended to delay but to enhance functional recovery. For select patients, longer supervised treatment may be required, and if further counseling beyond 3 months is indicated, documentation addressing which pertinent issues are pre-existing versus aggravated versus causative, as well as projecting a realistic functional prognosis, should be provided by the authorized treating provider every 4 to 6 weeks during treatment.

12. **RESTRICTION OF ACTIVITIES** varies according to the specific diagnosis and the severity of the condition. Job modification/modified duty are frequently required to avoid exacerbation of the injured lower extremity. Complete work cessation should be avoided, if possible, since it often further aggravates the pain presentation. Modified return-to-work is almost always more efficacious and rarely contraindicated in the vast majority of injured workers with lower extremity injuries.

13. **RETURN-TO-WORK** Early return-to-work should be a prime goal in treating occupational injuries given the poor return-to-work prognosis for an injured worker who has been out of work for more than six months. It is imperative that the patient be educated regarding the benefits of return-to-work, work restrictions, and follow-up if problems arise. When attempting to return a patient to work after a specific injury, clear objective restrictions of activity level should be made. An accurate job description with detailed physical duty restrictions is often necessary to assist the physician in making return-to-work recommendations. This may require a jobsite evaluation.

Employers should be prepared to offer transitional work. This may consist of temporary work in a less demanding position, return to the regular job with restrictions, or gradual return to the regular job. Company policies which encourage return-to-work with positive communication are most likely to have decreased worker disability.

Return-to-work is defined as any work or duty that the patient is able to perform safely. It may not be the patient's regular work. Due to the large spectrum of injuries of varying severity and varying physical demands in the work place, it is not possible to make

specific return-to-work guidelines for each injury. Therefore, the Division recommends the following:

- a. **Compliance with Activity Restrictions:** In some cases, compliance with restriction of activity levels may require a complete jobsite evaluation, a functional capacity evaluation (FCE), or other special testing. Refer to the "Special Tests" section of these guidelines.
- b. **Establishment of a Return-to-Work Status:** Ascertaining a return-to-work status is part of medical care, should be included in the treatment and rehabilitation plan, and addressed at every visit. A description of daily activity limitations is part of any treatment plan and should be the basis for restriction of work activities. In most cases non-surgical the patient should be able to return to work in some capacity or in an alternate position consistent with medical treatment within several days unless there are extenuating circumstances. Injuries requiring more than two weeks off work should be thoroughly documented (Some of these diagnoses are listed in Section E, Specific Lower Extremity Injury Diagnosis, Testing and Treatment).
- c. **Establishment of Activity Level Restrictions:** Communication is essential between the patient, employer and provider to determine appropriate restrictions and return-to-work dates. It is the responsibility of the physician to provide clear concise restrictions, and it the employer's responsibility to determine if temporary duties can be provided within the restrictions. For lower extremity injuries, the following should be addressed when describing the patient's activity level:
  - i. Lower body postures such as squatting, kneeling, crawling, stooping, or climbing, including duration and frequency.
  - ii. Ambulatory level for distance, frequency and terrain.
  - iii. Static and dynamic standing including duration and frequency.
  - iv. Ability to maintain balance.
  - v. Use of adaptive devices, including cane and walker, to accomplish basic job duties.

14. **THERAPY-ACTIVE** The following active therapies are widely used and accepted methods of care for a variety of work-related injuries. They are based on the philosophy that therapeutic exercise and/or activity are beneficial for restoring flexibility, strength, endurance, function, range-of-motion, and can alleviate discomfort. Active therapy requires an internal effort by the individual to complete a specific exercise or task. This form of therapy requires supervision from a therapist or medical provider such as verbal, visual and/or tactile instruction(s). At times, the provider may help stabilize the patient or guide the movement pattern but the energy required to complete the task is predominately executed by the patient.

Patients should be instructed to continue active therapies at home as an extension of the treatment process in order to maintain improvement levels. Follow-up visits to reinforce and monitor progress and proper technique are recommended. Home exercise can include exercise with or without mechanical assistance or resistance and functional activities with assistive devices.

The following active therapies are listed in alphabetical order:

a. **Activities of Daily Living (ADL):** are well-established interventions which involve instruction, active-assisted training, and/or adaptation of activities or equipment to improve a person's capacity in normal daily activities such as self-care, work re-integration training, homemaking, and driving.

- ❖ Time to Produce Effect: 4 to 5 treatments.
- ❖ Frequency: 3 to 5 times per week.
- ❖ Optimum Duration: 4 to 6 weeks.
- ❖ Maximum Duration: 6 weeks.

b. **Aquatic Therapy:** is a well-accepted treatment which consists of the therapeutic use of aquatic immersion for therapeutic exercise to promote ROM, flexibility, core stabilization, endurance, strengthening, body mechanics, and pain management. Aquatic therapy includes the implementation of active therapeutic procedures in a swimming or therapeutic pool. The water provides a buoyancy force that lessens the amount of force gravity applies to the body. The decreased gravity effect allows the patient to have a mechanical advantage and more likely to have a successful trial of therapeutic exercise. Studies have shown that the muscle recruitment for aquatic therapy versus similar non-aquatic motions is significantly less. Because there is always a risk of recurrent or additional damage to the muscle tendon unit after a surgical repair, aquatic therapy may be preferred by surgeons to gain early return of ROM. In some cases the patient will be able to do the exercises unsupervised after the initial supervised session. Parks and recreation contacts may be used to locate less expensive facilities for patients. Indications include:

- ❖ Post-operative therapy as ordered by the surgeon; or
- ❖ Intolerance for active land-based or full-weight-bearing therapeutic procedures; or
- ❖ Symptoms that are exacerbated in a dry environment; and
- ❖ Willingness to follow through with the therapy on a regular basis.

The pool should be large enough to allow full extremity ROM and fully erect posture. Aquatic vests, belts, snorkels, and other devices may be used to provide stability, balance, buoyancy, and resistance.

- ❖ Time to Produce Effect: 4 to 5 treatments.
- ❖ Frequency: 3 to 5 times per week.
- ❖ Optimum Duration: 4 to 6 weeks.
- ❖ Maximum Duration: 8 weeks.

A self-directed program is recommended after the supervised aquatics program has been established, or alternatively a transition to a self-directed dry environment exercise program.

There is some evidence that for osteoarthritis of the hip or knee, aquatic exercise probably slightly reduces pain and slightly improves function over 3 months.

- c. **Functional Activities:** are the use of therapeutic activity to enhance mobility, body mechanics, employability, coordination, balance, and sensory motor integration.
- ❖ Time to Produce Effect: 4 to 5 treatments
  - ❖ Frequency: 3 to 5 times per week.
  - ❖ Optimum Duration: 4 to 6 weeks.
  - ❖ Maximum Duration: 6 weeks
- d. **Functional Electrical Stimulation:** is the application of electrical current to elicit involuntary or assisted contractions of atrophied and/or impaired muscles. Indications include muscle atrophy, weakness, sluggish muscle contraction, neuromuscular dysfunction or peripheral nerve lesion. Indications also may include an individual who is precluded from active therapy.
- ❖ Time to Produce Effect: 2 to 6 treatments.
  - ❖ Frequency: 3 times per week.
  - ❖ Optimum Duration: 8 weeks.
  - ❖ Maximum Duration: 8 weeks. If beneficial, provide with home unit. Home use is not recommended for neuromuscularly intact patients.
- e. **Gait Training:** is crutch walking, cane or walker instruction to a person with lower extremity injury or surgery. Indications include the need to promote normal gait pattern with assistive devices; instruct in the safety and proper use of assistive devices; instruct in progressive use of more independent devices (i.e., platform-walker, to walker, to crutches, to cane); instruct in gait on uneven surfaces and steps (with and without railings) to reduce risk of fall, or loss of balance; and/or instruct in equipment to limit weight-bearing for the protection of a healing injury or surgery.
- ❖ Time to Produce Effect: 2 to 6 treatments.
  - ❖ Frequency: 2 to 3 times per week.
  - ❖ Optimum Duration: 2 weeks.
  - ❖ Maximum Duration: 2 weeks.
- f. **Neuromuscular Re-education:** is the skilled application of exercise with manual, mechanical, or electrical facilitation to enhance strength; movement

patterns; neuromuscular response; proprioception; kinesthetic sense; coordination; education of movement, balance and posture. Indications include the need to promote neuromuscular responses through carefully timed proprioceptive stimuli to elicit and improve motor activity in patterns similar to normal neurologically developed sequences, and improve neuromotor response with independent control.

- ❖ Time to Produce Effect: 2 to 6 treatments.
- ❖ Frequency: 3 times per week.
- ❖ Optimum Duration: 4 to 8 weeks.
- ❖ Maximum Duration: 8 weeks.

**g. Therapeutic Exercise:** is a generally accepted treatment with or without mechanical assistance or resistance, may include isoinertial, isotonic, isometric and isokinetic types of exercises. There is good evidence to support the functional benefits of manual therapy with exercise, walking programs, conditioning, and other combined therapy programs. Indications include the need for cardiovascular fitness, reduced edema, improved muscle strength, improved connective tissue strength and integrity, increased bone density, promotion of circulation to enhance soft tissue healing, improvement of muscle recruitment, increased range of motion and are used to promote normal movement patterns. May also include complementary/alternative exercise movement therapy.

- ❖ Time to Produce Effect: 2 to 6 treatments.
- ❖ Frequency: 3 to 5 times per week.
- ❖ Optimum Duration: 4 to 8 weeks.
- ❖ Maximum Duration: 8 weeks.

**h. Wheelchair Management and Propulsion:** is the instruction and training of self-propulsion and proper use of a wheelchair. This includes transferring and safety instruction. This is indicated in individuals who are not able to ambulate due to bilateral lower extremity injuries, inability to use ambulatory assistive devices, and in cases of multiple traumas.

- ❖ Time to Produce Effect: 2 to 6 treatments.
- ❖ Frequency: 2 to 3 times per week.
- ❖ Optimum Duration: 2 weeks.
- ❖ Maximum Duration: 2 weeks.

**15. THERAPY-PASSIVE** Most of the following passive therapies and modalities are generally well-accepted methods of care for a variety of work-related injuries. Passive therapy includes those treatment modalities that do not require energy expenditure on the part of the patient. They are principally effective during the early phases of treatment and are directed at controlling symptoms such as pain, inflammation and swelling and to improve the rate of healing soft tissue injuries. They should be use adjunctively with

active therapies to help control swelling, pain, and inflammation during the rehabilitation process. They may be used intermittently as a therapist deems appropriate or regularly if there are specific goals with objectively measured functional improvements during treatment.

On occasion, specific diagnoses and post-surgical conditions may warrant durations of treatment beyond those listed as "maximum." Factors such as exacerbation of symptoms, re-injury, interrupted continuity of care and comorbidities may also extend durations of care. Specific goals with objectively measured functional improvement during treatment must be cited to justify extended durations of care. It is recommended that, if no functional gain is observed after the number of treatments under "time to produce effect" has been completed alternative treatment interventions, further diagnostic studies, or further consultations should be pursued.

The following passive therapies and modalities are listed in alphabetical order.

- a. **Continuous Passive Motion (CPM):** is a form of passive motion using specialized machinery that acts to move a joint and may also pump blood and edema fluid away from the joint and periarticular tissues. CPM is effective in preventing the development of joint stiffness if applied immediately following surgery. It should be continued until the swelling that limits motion of the joint no longer develops. ROM for the joint begins at the level of patient tolerance and is increased twice a day as tolerated. Home use of CPM is expected after chondral defect surgery. CPM may be necessary for cases with ACL repair, manipulation, joint replacement or other knee surgery if the patient has been non compliant with pre-operative ROM exercises. Use of this equipment may require home visits.
  - ❖ Time to Produce Effect: Immediate.
  - ❖ Frequency: Up to 4 times a day.
  - ❖ Optimum Duration: Up to 3 weeks post surgical.
  - ❖ Maximum Duration: 3 weeks.
  
- b. **Contrast Baths:** can be used for alternating immersion of extremities in hot and cold water. Indications include edema in the sub-acute stage of healing, the need to improve peripheral circulation and decrease joint pain and stiffness.
  - ❖ Time to Produce Effect: 3 treatments.
  - ❖ Frequency: 3 times per week.
  - ❖ Optimum Duration: 4 weeks.
  - ❖ Maximum Duration: 1 month.
  
- c. **Electrical Stimulation (Unattended):** once applied, requires minimal on-site supervision by the physician or non-physician provider. Indications include pain, inflammation, muscle spasm, atrophy, decreased circulation, and the need for osteogenic stimulation.
  - ❖ Time to Produce Effect: 2 to 4 treatments.

- ❖ Frequency: Varies, depending upon indication, between 2 to 3 times per day to 1 time a week. Provide home unit if treatment is effective and frequent use is recommended.
  - ❖ Optimum Duration: 1 to 3 months.
  - ❖ Maximum Duration: 3 months.
- d. **Fluidotherapy:** employs a stream of dry, heated air that passes over the injured body part. The injured body part can be exercised during the application of dry heat. Indications include the need to enhance collagen extensibility before stretching, reduce muscle guarding, or reduce inflammatory response.
- ❖ Time to Produce Effect: 1 to 4 treatments.
  - ❖ Frequency: 1 to 3 times per week.
  - ❖ Optimum Duration: 4 weeks.
  - ❖ Maximum Duration: 1 month.
- e. **Hyperbaric Oxygen Therapy:** There is no evidence to support long-term benefit of hyperbaric oxygen therapy for non-union lower extremity fractures. It is not recommended.
- f. **Infrared Therapy:** is a radiant form of heat application. Indications include the need to elevate the pain threshold before exercise and to alleviate muscle spasm to promote increased movement.
- ❖ Time to Produce Effect: 2 to 4 treatments.
  - ❖ Frequency: 3 to 5 times per week.
  - ❖ Optimum Duration: 3 weeks as primary, or up to 2 months if used intermittently as an adjunct to other therapeutic procedures.
  - ❖ Maximum Duration: 2 months.
- g. **Iontophoresis:** is the transfer of medication, including, but not limited to, steroidal anti-inflammatory and anesthetics, through the use of electrical stimulation. Indications include pain (Lidocaine), inflammation (hydrocortisone, salicylate), edema (mecholy, hyaluronidase, and salicylate), ischemia (magnesium, mecholy, and iodine), muscle spasm (magnesium, calcium); calcific deposits (acetate), scars, and keloids (chlorine, iodine, acetate).
- ❖ Time to Produce Effect: 1 to 4 treatments.
  - ❖ Frequency: 3 times per week with at least 48 hours between treatments.
  - ❖ Optimum Duration: 8 to 10 treatments.
  - ❖ Maximum Duration: 10 treatments.

- h. **Manipulation:** is a generally accepted, well-established and widely used therapeutic intervention for lower extremity injuries. Manipulative treatment (not therapy) is defined as the therapeutic application of manually guided forces by an operator to improve physiologic function and/or support homeostasis that has been altered by the injury or occupational disease, and has associated clinical significance.

High velocity, low amplitude (HVLA) technique, chiropractic manipulation, osteopathic manipulation, muscle energy techniques, counter strain, and non-force techniques are all types of manipulative treatment. This may be applied by osteopathic physicians (D.O.), chiropractors (D.C.), properly trained physical therapists (P.T.), properly trained occupational therapists (O.T.), or properly trained medical physicians. Under these different types of manipulation exist many subsets of different techniques that can be described as a) direct a forceful engagement of a restrictive/pathologic barrier, b) indirect a gentle/non-forceful disengagement of a restrictive/pathologic barrier, c) the patient actively assists in the treatment and d) the patient relaxing, allowing the practitioner to move the body tissues. When the proper diagnosis is made and coupled with the appropriate technique, manipulation has no contraindications and can be applied to all tissues of the body. Pre-treatment assessment should be performed as part of each manipulative treatment visit to ensure that the correct diagnosis and correct treatment is employed.

- ❖ Time to Produce Effect (for all types of manipulative treatment): 1 to 6 treatments.
- ❖ Frequency: Up to 3 times per week for the first 3 weeks as indicated by the severity of involvement and the desired effect.
- ❖ Optimum Duration: 10 treatments.
- ❖ Maximum Duration: 12 treatments. Additional visits may be necessary in cases of re-injury, interrupted continuity of care, exacerbation of symptoms, and in those patients with co-morbidities. Functional gains including increased ROM must be demonstrated to justify continuing treatment.

- i. **Manual Electrical Stimulation:** is used for peripheral nerve injuries or pain reduction that requires continuous application, supervision, or involves extensive teaching. Indications include muscle spasm (including TENS), atrophy, decreased circulation, osteogenic stimulation, inflammation, and the need to facilitate muscle hypertrophy, muscle strengthening, muscle responsiveness in Spinal Cord Injury/Brain Injury (SCI/BI), and peripheral neuropathies.

- ❖ Time to Produce Effect: Variable, depending upon use.
- ❖ Frequency: 3 to 7 times per week.
- ❖ Optimum Duration: 8 weeks.
- ❖ Maximum Duration: 2 months.

- j. **Massage—Manual or Mechanical:** Massage is manipulation of soft tissue with broad ranging relaxation and circulatory benefits. This may include stimulation of

acupuncture points and acupuncture channels (acupressure), application of suction cups and techniques that include pressing, lifting, rubbing, pinching of soft tissues by, or with, the practitioners' hands. Indications include edema (peripheral or hard and non-pliable edema), muscle spasm, adhesions, the need to improve peripheral circulation and range of motion, or to increase muscle relaxation, and flexibility prior to exercise. In cases with edema, deep vein thrombosis should be ruled out prior to treatment.

- ❖ Time to Produce Effect: Immediate.
- ❖ Frequency: 1 to 2 times per week.
- ❖ Optimum Duration: 6 weeks.
- ❖ Maximum Duration: 2 months.

**k. Mobilization (Joint):** Mobilization is passive movement, which may include passive range of motion performed in such a manner (particularly in relation to the speed of the movement) that it is, at all times, within the ability of the patient to prevent the movement if they so choose. It may include skilled manual joint tissue stretching. Indications include the need to improve joint play, improve intracapsular arthrokinematics, or reduce pain associated with tissue impingement.

- ❖ Time to Produce Effect: 6 to 9 treatments.
- ❖ Frequency: 3 times per week.
- ❖ Optimum Duration: 6 weeks.
- ❖ Maximum Duration: 2 months.

**l. Mobilization (Soft Tissue):** is a generally well-accepted treatment. Mobilization of soft tissue is the skilled application of muscle energy, strain/counter strain, myofascial release, manual trigger point release and manual therapy techniques designed to improve or normalize movement patterns through the reduction of soft tissue pain and restrictions. These can be interactive with the patient participating or can be with the patient relaxing and letting the practitioner move the body tissues. Indications include muscle spasm around a joint, trigger points, adhesions, and neural compression. Mobilization should be accompanied by active therapy.

- ❖ Time to Produce Effect: 2 to 3 weeks.
- ❖ Frequency: 2 to 3 times per week.
- ❖ Optimum Duration: 4 to 6 weeks.
- ❖ Maximum Duration: 6 weeks.

**m. Paraffin Bath:** is a superficial heating modality that uses melted paraffin (candle wax) to treat irregular surfaces such as the foot or ankle. Indications include the need to enhance collagen extensibility before stretching, reduce muscle guarding, or reduce inflammatory response.

- ❖ Time to Produce Effect: 1 to 4 treatments.
- ❖ Frequency: 1 to 3 times per week.
- ❖ Optimum Duration: 4 weeks.
- ❖ Maximum Duration: 1 month. If beneficial, provide with home unit or purchase if effective.

n. **Superficial Heat and Cold Therapy:** Superficial heat and cold therapies are thermal agents applied in various manners that lower or raise the body tissue temperature for the reduction of pain, inflammation, and/or effusion resulting from injury or induced by exercise. It may be used acutely with compression and elevation. Indications include acute pain, edema and hemorrhage, need to increase pain threshold, reduce muscle spasm and promote stretching/flexibility. It includes portable cryotherapy units and application of heat just above the surface of the skin at acupuncture points.

- ❖ Time to Produce Effect: Immediate.
- ❖ Frequency: 2 to 5 times per week.
- ❖ Optimum Duration: 3 weeks as primary, or up to 2 months if used intermittently as an adjunct to other therapeutic procedures.
- ❖ Maximum Duration: 2 months.

o. **Short-wave Diathermy:** involves the use of equipment that exposes soft tissue to a magnetic or electrical field. Indications include enhanced collagen extensibility before stretching, reduced muscle guarding, reduced inflammatory response, and enhanced re-absorption of hemorrhage, hematoma, or edema.

- ❖ Time to Produce Effect: 2 to 4 treatments.
- ❖ Frequency: 2 to 3 times per week up to 3 weeks.
- ❖ Optimum Duration: 3 to 5 weeks.
- ❖ Maximum Duration: 5 weeks.

p. **Traction:** Manual traction is an integral part of manual manipulation or joint mobilization. Indications include decreased joint space, muscle spasm around joints, and the need for increased synovial nutrition and response.

- ❖ Time to Produce Effect: 1 to 3 sessions.
- ❖ Frequency: 2 to 3 times per week.
- ❖ Optimum Duration: 30 days.
- ❖ Maximum Duration: 1 month.

q. **Transcutaneous Electrical Nerve Stimulation (TENS):** is a generally accepted treatment. TENS should include at least one instructional session for proper

application and use. Indications include muscle spasm, atrophy, and decreased circulation and pain control. Minimal TENS unit parameters should include pulse rate, pulse width and amplitude modulation. Consistent, measurable functional improvement must be documented prior to the purchase of a home unit.

- ❖ Time to Produce Effect: Immediate.
- ❖ Frequency: Variable.
- ❖ Optimum Duration: 3 sessions.
- ❖ Maximum Duration: 3 sessions. If beneficial, provide with home unit or purchase if effective. Due to variations in costs and in models, prior authorization for home units is required.

- r. **Ultrasound:** is an accepted treatment which includes ultrasound with electrical stimulation and Phonophoresis. Ultrasound uses sonic generators to deliver acoustic energy for therapeutic thermal and/or non-thermal soft tissue effects. Indications include scar tissue, adhesions, collagen fiber and muscle spasm, and the need to extend muscle tissue or accelerate the soft tissue healing.

Ultrasound with electrical stimulation is concurrent delivery of electrical energy that involves a dispersive electrode placement. Indications include muscle spasm, scar tissue, pain modulation, and muscle facilitation.

Phonophoresis is the transfer of medication to the target tissue to control inflammation and pain through the use of sonic generators. These topical medications include, but are not limited to, steroidal anti-inflammatory and anesthetics.

- ❖ Time to Produce Effect: 6 to 15 treatments.
- ❖ Frequency: 3 times per week.
- ❖ Optimum Duration: 4 to 8 weeks.
- ❖ Maximum Duration: 2 months.

- s. **Vasopneumatic Devices:** are mechanical compressive devices used in both inpatient and outpatient settings to reduce various types of edema. Indications include pitting edema, lymphedema and venostasis. Maximum compression should not exceed minimal diastolic blood pressure. Use of a unit at home should be considered if expected treatment is greater than two weeks.

- ❖ Time to Produce Effect: 1 to 3 treatments.
- ❖ Frequency: 3 to 5 times per week.
- ❖ Optimum Duration: 1 month.
- ❖ Maximum Duration: 1 month. If beneficial, provide with home unit.

- t. **Whirlpool/Hubbard Tank:** is conductive exposure to water at temperatures that best elicits the desired effect (cold vs. heat). It generally includes massage by

water propelled by a turbine or Jacuzzi jet system and has the same thermal effects as hot packs if higher than tissue temperature. It has the same thermal effects as cold application if comparable temperature water used. Indications include the need for analgesia, relaxing muscle spasm, reducing joint stiffness, enhancing mechanical debridement and facilitating and preparing for exercise.

- ❖ Time to Produce Effect: 2 to 4 treatments.
- ❖ Frequency: 3 to 5 times per week.
- ❖ Optimum Duration: 3 weeks as primary, or up to 2 months if used intermittently as an adjunct to other therapeutic procedures.
- ❖ Maximum Duration: 2 months.

16. **VOCATIONAL REHABILITATION** is a generally accepted intervention, but Colorado limits its use as a result of Senate Bill 87-79. Initiation of vocational rehabilitation requires adequate evaluation of patients for quantification of highest functional level, motivation and achievement of maximum medical improvement (MMI). Vocational rehabilitation may be as simple as returning to the original job or as complicated as being retrained for a new occupation. The effectiveness of vocational rehabilitation may be enhanced when performed in combination with work hardening or work conditioning.

It may also be beneficial for full vocational rehabilitation to be started before MMI if it is evident that the injured worker will be unable to return to his/her previous occupation. A positive goal and direction may aid the patient in decreasing stress and depression, and promote optimum rehabilitation.

## **G. THERAPEUTIC PROCEDURES — OPERATIVE**

All operative interventions must be based upon positive correlation of clinical findings, clinical course and diagnostic tests. A comprehensive assimilation of these factors must lead to a specific diagnosis with positive identification of pathologic condition(s). It is imperative to rule out non-physiologic modifiers of pain presentation or non-operative conditions mimicking radiculopathy or instability (e.g., peripheral neuropathy, piriformis syndrome, myofascial pain, complex regional pain syndrome or sympathetically mediated pain syndromes, sacroiliac dysfunction, psychological conditions, etc.) prior to consideration of elective surgical intervention.

In addition, operative treatment is indicated when the natural history of surgically treated lesions is better than the natural history for non-operatively treated lesions. All patients being considered for surgical intervention should first undergo a comprehensive neuromusculoskeletal examination to identify mechanical pain generators that may respond to non-surgical techniques or may be refractory to surgical intervention.

Structured rehabilitation interventions are necessary for all of the following procedures except in some cases of hardware removal.

Return-to-work restrictions should be specific according to the recommendation in the Section F. 13, Therapeutic Procedures, Non-operative.

### **1. ANKLE AND SUBTALAR FUSION**

- a. Description/Definition:** Surgical fusion of the ankle or subtalar joint.
- b. Occupational Relationship:** Usually post-traumatic arthritis or residual deformity.
- c. Specific Physical Exam Findings:** Painful, limited range of motion of the joint(s). Possible fixed deformity.
- d. Diagnostic Testing Procedures:** Radiographs. Diagnostic injections, MRI, CT scan, and/or bone scan.
- e. Surgical Indications/Considerations:** All reasonable conservative measures have been exhausted and other reasonable surgical options have been seriously considered or implemented. Patient has disabling pain or deformity. Fusion is the procedure of choice for individuals with osteoarthritis who plan to return to physically demanding activities.

Prior to surgical intervention, the patient and treating physician should identify functional operative goals, and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.

Because smokers have a higher risk of delayed bone healing and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

- f. **Operative Procedures:** Open reduction internal fixation (ORIF) with possible bone grafting. External fixation may be used in some cases.
- g. **Post-operative Treatment:**
  - i. An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing, and exercise progressions.
  - ii. When boney union is achieved, treatment usually includes active therapy with or without passive therapy, including gait training and ADLs.
  - iii. Rocker bottom soles or shoe lifts may be required. A cast is usually in place for 6 to 8 weeks followed by graduated weight-bearing. Modified duty may last up to 4 to 6 months.
  - iv. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

## 2. **KNEE FUSION**

- a. **Description/Definition:** Surgical fusion of femur to the tibia at the knee joint.
- b. **Occupational Relationship:** Usually from post-traumatic arthritis or deformity.
- c. **Specific Physical Exam Findings:** Stiff, painful, sometime deformed limb at the knee joint.
- d. **Diagnostic Testing Procedures:** Radiographs. MRI, CT, diagnostic injections or bone scan.
- e. **Surgical Indications/Considerations:** All reasonable conservative measures have been exhausted and other reasonable surgical options have been seriously considered or implemented, e.g. failure of arthroplasty. Fusion is a consideration particularly in the young patient who desires a lifestyle that would subject the knee to high mechanical stresses. The patient should understand that the leg will be shortened and there may be difficulty with sitting in confined spaces, and climbing stairs. Although there is generally a painless knee, up to 50% of cases may have complications.

Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.

Because smokers have a higher risk of delayed bone healing and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-

operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

- f. **Operative Procedures:** Open reduction internal fixation (ORIF) with possible bone grafting. External fixation or intramedullary rodding may also be used.
- g. **Post-operative Treatment:**
- i. An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing, and exercise progressions.
  - ii. When boney union is achieved, treatment usually includes active therapy with or without passive therapy, including gait training and ADLs. Non weight-bearing or limited weight-bearing and modified duty may last up to 4 and 6 months.
  - iii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

### 3. **ANKLE ARTHROPLASTY**

- a. **Description/Definition:** Prosthetic replacement of the articulating surfaces of the ankle joint.
- b. **Occupational Relationship:** Usually from post-traumatic arthritis.
- c. **Specific Physical Exam Findings:** Stiff, painful ankle. Limited range-of-motion of the ankle joint.
- d. **Diagnostic Testing Procedures:** Radiographs, MRI, diagnostic injections, CT scan, bone scan.
- e. **Surgical Indications/Considerations:** When pain interferes with ADLs, and all reasonable conservative measures have been exhausted and other reasonable surgical options have been considered or implemented. A very limited population of patients are appropriate for ankle arthroplasty.

Requirements include:

- Good bone quality;
- BMI less than 35;
- Non-smoker currently;
- Patient is 60 or older;
- No lower extremity neuropathy;

- Patient does not pursue physically demanding work or recreational activities.

The following issues should be addressed when determining appropriateness for surgery: ankle laxity, bone alignment, surrounding soft tissue quality, vascular status, presence of avascular necrosis, history of open fracture or infection, motor dysfunction, and treatment of significant knee or hip pathology.

Ankle implants are less successful than similar procedures in the knee or hip. There are no good studies comparing arthrodesis and ankle replacement. Patients with ankle fusions generally have good return to function and fewer complications than those with joint replacements. Re-operation rates may be higher in ankle arthroplasty than in ankle arthrodesis. Long-term performance beyond ten years for current devices is still unclear. Salvage procedures for ankle replacement include revision with stemmed implant or allograft fusion. Given these factors, an ankle arthroplasty requires prior authorization and a second opinion by a surgeon specializing in lower extremity surgery.

**Contraindications** - severe osteoporosis, significant general disability due to other medical conditions, psychiatric issues.

In cases where surgery is contraindicated due to obesity, it may be appropriate to recommend a weight loss program if the patient is unsuccessful losing weight on their own. Coverage for weight loss would continue only for motivated patients who have demonstrated continual progress with weight loss.

Prior to surgery, patients may be assessed for any associated mental health or low back pain issues that may affect rehabilitation.

Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.

Because smokers have a higher risk of delayed bone healing and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

- f. **Operative Procedures:** Prosthetic replacement of the articular surfaces of the ankle; DVT prophylaxis is not always required but should be considered for patients who have any risk factors for thrombosis.

**Complications** – include pulmonary embolism, infection, bony lysis, polyethylene wear, tibial loosening, instability, malalignment, stiffness, nerve-vessel injury, and peri-prosthetic fracture.

- g. **Post-operative Treatment:**
- i. An individualized rehabilitation program based upon communication between the surgeon and the therapist while using therapies as outlined

in Section F. Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing, and exercise progressions.

- ii. NSAIDs may be used for pain management after joint replacement. They have also been used to reduce heterotopic ossification after ankle arthroplasty. NSAIDs do reduce the radiographically documented heterotopic ossification in this setting, but there is some evidence (in literature on hip arthroplasty) that they do not improve functional outcomes and they may increase the risk of bleeding events in the post-operative period. Their routine use for prevention of heterotopic bone formation is not recommended.
- iii. Treatment may include the following: bracing, active therapy with or without passive therapy, gait training, and ADLs. Rehabilitation post-operatively may need to be specifically focused based on the following problems: contracture, gastrocnemius muscle weakness, and foot and ankle malalignment. Thus, therapies may include braces, shoe lifts, orthoses, and electrical stimulation accompanied by focused therapy.
- iv. In some cases aquatic therapy may be used. Refer to Section F, Therapeutic Procedures, Non-operative 14, b, Aquatic Therapy. Pool exercises may be done initially under therapist's or surgeon's direction then progressed to an independent pool program.
- v. Prior to revision surgery there should be an evaluation to rule out infection.
- vi. Return to work and restrictions after surgery may be made by a treating physician experienced in occupational medicine in consultation with the surgeon or by the surgeon. Patient should be able to return to sedentary work within 4 to 6 weeks. Some patients may have permanent restrictions based on their job duties.
- vii. Patients are usually seen annually after initial recovery to check plain x-rays for signs of loosening.

#### 4. KNEE ARTHROPLASTY

- a. **Description/Definition:** Prosthetic replacement of the articulating surfaces of the knee joint.
- b. **Occupational Relationship:** Usually from post-traumatic osteoarthritis.
- c. **Specific Physical Exam Findings:** Stiff, painful knee, and possible effusion.
- d. **Diagnostic Testing Procedures:** Radiographs.
- e. **Surgical Indications/Considerations:** Severe osteoarthritis and all reasonable conservative measures have been exhausted and other reasonable surgical options have been considered or implemented. Significant changes such as advanced joint line narrowing are expected. Refer to subsection E.2. a, Aggravated Osteoarthritis.

Younger patients, less than 50 years of age, may be considered for unicompartmental replacement if there is little or no arthritis in the lateral compartment, there is no inflammatory disease and/or deformity and BMI is less than 35. They may be considered for lateral unicompartmental disease when the patient is not a candidate for osteotomy. Outcome is better for patients with social support.

**Contraindications** - severe osteoporosis, significant general disability due to other medical conditions, psychiatric issues.

In cases where surgery is contraindicated due to obesity, it may be appropriate to recommend a weight loss program if the patient is unsuccessful losing weight on their own. Coverage for weight loss would continue only for motivated patients who have demonstrated continual progress with weight loss.

Prior to surgery, patients may be assessed for any associated mental health or low back pain issues that may affect rehabilitation.

Prior to surgical intervention, the patient and treating physician should identify functional operative goals and the likelihood of achieving improved ability to perform activities of daily living or work activities and the patient should agree to comply with the pre- and post-operative treatment plan including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative therapy required and the length of partial- and full-disability expected post-operatively.

Because smokers have a higher risk of delayed bone healing and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

- f. **Operative Procedures:** Prosthetic replacement of the articular surfaces of the knee; total or uni-compartmental with DVT prophylaxis. May include patellar resurfacing and computer assistance.

There is currently conflicting evidence on the effectiveness of patellar resurfacing. Isolated patellofemoral resurfacing is performed on patients under 60 only after diagnostic arthroscopy does not reveal any arthritic changes in other compartments. The diagnostic arthroscopy is generally performed at the same time as the resurfacing. Resurfacing may accompany a total knee replacement at the discretion of the surgeon.

Computer guided implants are more likely to be correctly aligned. The overall long-term functional result using computer guidance is unclear. Decisions to use computer assisted methods depend on surgeon preference and age of the patient as it is more likely to have an impact on younger patients with longer expected use and wear of the implant. Alignment is only one of many factors that may affect the implant longevity.

**Complications** – occur in around 3% and include pulmonary embolism; infection, bony lysis, polyethylene wear, tibial loosening, instability, malalignment, stiffness, patellar tracking abnormality, nerve-vessel injury, and peri-prosthetic fracture.

**g. Post-operative Treatment:**

- i. Anti coagulant therapy to prevent deep vein thrombosis. Refer to Section F., Therapeutic Procedures, Non-operative.
- ii. NSAIDs may be used for pain management after joint replacement. They have also been used to reduce heterotopic ossification after knee arthroplasty. NSAIDs do reduce the radiographically documented heterotopic ossification in this setting, but there is some evidence (in literature on total hip arthroplasty) that they do not improve functional outcomes and they may increase the risk of bleeding events in the post-operative period. Their routine use for prevention of heterotopic bone formation is not recommended.
- iii. An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing, and exercise progressions.
- iv. Treatment may include the following: bracing and active therapy with or without passive therapy. Rehabilitation post-operatively may need to be specifically focused based on the following problems: knee flexion contracture, quadriceps muscle weakness, knee flexion deficit, and foot, and ankle malalignment. Thus, therapies may include, knee braces, shoe lifts, orthoses, and electrical stimulation, accompanied by focused active therapy.
- v. In some cases aquatic therapy may be used. Refer to Section F, 14. b. Therapeutic Procedures, Non-operative, Aquatic Therapy. Pool exercises may be done initially under therapist's or surgeon's direction then progressed to an independent pool program.
- vi. Continuous passive motion is frequently prescribed. The length of time it is used will depend on the patient and their ability to return to progressive exercise.
- vii. Consider need for manipulation under anesthesia if there is less than 90 degrees of knee flexion after 6 weeks.
- viii. Prior to revision surgery there should be an evaluation to rule out infection.
- ix. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon. Patient should be able to return to sedentary work within 4 to 6 weeks. Some patients may have permanent restrictions based on their job duties.
- x. Patients are usually seen annually after initial recovery to check plain x-rays for signs of loosening.

**5. HIP ARTHROPLASTY**

- a. **Description/Definition:** Prosthetic replacement of the articulating surfaces of the hip joint. In some cases, hip resurfacing may be performed.
- b. **Occupational Relationship:** Usually from post-traumatic arthritis, hip dislocations and femur or acetabular fractures. Patients with intracapsular femoral fractures have a risk of developing avascular necrosis of the femoral head requiring treatment months to years after the initial injury.
- c. **Specific Physical Exam Findings:** Stiff, painful hip.
- d. **Diagnostic Testing Procedures:** Standing pelvic radiographs demonstrating joint space narrowing to 2 mm or less, osteophytes or sclerosis at the joint. MRI may be ordered to rule out other more serious disease.
- e. **Surgical Indications/Considerations:** Severe osteoarthritis and all reasonable conservative measures have been exhausted and other reasonable surgical options have been considered or implemented. Refer to subsection E. 3. b. Aggravated Osteoarthritis.

**Possible contraindications** - inadequate bone density, prior hip surgery, and obesity.

In cases where surgery is contraindicated due to obesity, it may be appropriate to recommend a weight loss program if the patient is unsuccessful losing weight on their own. Coverage for weight loss would continue only for motivated patients who have demonstrated continual progress with weight loss.

Prior to surgery, patients may be assessed for any associated mental health or low back pain issues that may affect rehabilitation.

For patients undergoing total hip arthroplasty, there is some evidence that a pre-operative exercise conditioning program, including aquatic and land-based exercise, results in quicker discharge to home than pre-operative education alone without an exercise program.

Aseptic loosening of the joint requiring revision surgery occurs in some patients. Prior to revision the joint should be checked to rule out possible infection which may require a bone scan as well as laboratory procedures, including a radiologically directed joint aspiration.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that carriers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

- f. **Operative Procedures:** Prosthetic replacement of the articular surfaces of the hip, ceramic or metal prosthesis, with DVT prophylaxis. Ceramic prosthesis is more expensive; however, it is expected to have greater longevity and may be appropriate in some younger patients. Hip resurfacing, metal on metal, is an option for younger or active patients likely to out-live traditional total hip replacements.

**Complications include**, leg length inequality, deep venous thrombosis with possible pulmonary embolus, hip dislocation, possible renal effects, need for transfusions, future infection, need for revisions, fracture at implant site.

The long-term benefit for computer assisted hip replacements is unknown. It may be useful in younger patients. Prior authorization is required.

Robotic assisted surgery is considered experimental and not recommended due to technical difficulties.

**g. Post-operative Treatment:**

- i. Anti coagulant therapy is used to prevent deep vein thrombosis. Refer to Section F, Therapeutic Procedures, Non-operative.
- ii. NSAIDs may be used for pain management after joint replacement. They have also been used to reduce heterotopic ossification after hip arthroplasty. NSAIDs do reduce the radiographically documented heterotopic ossification in this setting, but there is some evidence that they do not improve functional outcomes and they may increase the risk of bleeding events in the post-operative period. Their routine use for prevention of heterotopic bone formation is not recommended.
- iii. An individualized rehabilitation program based upon communication between the surgeon and the therapist and using the therapies as outlined in Section F. Therapeutic Procedures Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing and exercise progressions.
- iv. Treatment usually includes active therapy with or without passive therapy with emphasis on gait training with appropriate assistive devices. Patients with accelerated return to therapy appear to do better. Therapy should include training on the use of adaptive equipment and home and work site evaluation when appropriate.

There is good evidence for the use of aquatic therapy. Refer to Section F., 14. b. Therapeutic Procedures, Non-operative. Pool exercises may be done initially under a therapist's or surgeon's direction then progressed to an independent pool program.

There is some evidence that, for patients older than 60, early multidisciplinary therapy may shorten hospital stay and improve activity level for those receiving hip replacement. Therefore, this may be used for selected patients.
- v. Return to activities at 4 to 6 weeks with appropriate restrictions by the surgeon. Initially range of motion is usually restricted. Return to activity after full recovery depends on the surgical approach. Patients can usually lift, but jogging and other high impact activities are avoided.
- vi. Helical CT or MRI with artifact minimization may be used to investigate prosthetic complications. The need for implant revision is determined by age, size of osteolytic lesion, type of lesion and functional status. Revision surgery may be performed by an orthopedic surgeon in cases

with chronic pain and stiffness or difficulty with activities of daily living. Prior authorization is required and a second opinion by a surgeon with special expertise in hip/knee replacement surgery should usually be performed.

- vii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.
- viii. Patients are usually seen annually after the initial recovery to check plain x-rays for signs of loosening.

## 6. **AMPUTATION**

- a. **Description/Definition:** Surgical removal of a portion of the lower extremity.
- b. **Occupational Relationship:** Usually secondary to post-traumatic bone, soft tissue, vascular or neurologic compromise of part of the extremity.
- c. **Specific Physical Exam Findings:** Non-useful or non-viable portion of the lower extremity.
- d. **Diagnostic Testing Procedures:** Radiographs, vascular studies, MRI, bone scan.
- e. **Surgical Indications/Considerations:** Non-useful or non-viable portion of the extremity.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.

- f. **Operative Procedures:** Amputation.
- g. **Post-operative Treatment:**
  - i. An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative.
  - ii. Rigid removable dressings are used initially.
  - iii. Therapies usually include active therapy with or without passive therapy for prosthetic fitting, construction and training, protected weight-bearing, training on the use of adaptive equipment, and home and jobsite evaluation. Temporary prosthetics are used initially with a final prosthesis fitted by the second year. Multiple fittings and trials may be necessary to assure the best functional result.
  - iv. For prosthesis with special adaptive devices, e.g. computerized prosthesis; prior authorization and a second opinion from a physician knowledgeable in prosthetic rehabilitation and who has a clear description of the patients expected job duties and daily living activities are required.

- v. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

## 7. **MANIPULATION UNDER ANESTHESIA**

- a. **Description/Definition:** Passive range of motion of a joint under anesthesia.
- b. **Occupational Relationship:** Joint stiffness that usually results from a traumatic injury, compensation related surgery, or other treatment.
- c. **Specific Physical Exam Findings:** Joint stiffness in both active and passive modes.
- d. **Diagnostic Testing Procedures:** Radiographs. CT, MRI, diagnostic injections.
- e. **Surgical Indications/Considerations:** Consider if routine therapeutic modalities, including therapy and/or dynamic bracing, do not restore the degree of motion that should be expected after a reasonable period of time, usually at least 12 weeks.
- f. **Operative Treatment:** Not applicable.
- g. **Post-operative Treatment:**
  - i. An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative. Therapy includes a temporary increase in frequency of both active and passive therapy to maintain the range of motion gains from surgery.
  - ii. Continuous passive motion is frequently used post-operatively.
  - iii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

## 8. **OSTEOTOMY**

- a. **Description/Definition:** A reconstructive procedure involving the surgical cutting of bone for realignment. It is useful for patients that would benefit from realignment in lieu of total joint replacement.
- b. **Occupational Relationship:** Post-traumatic arthritis or deformity.
- c. **Specific Physical Exam Findings:** Painful decreased range of motion and/or deformity.
- d. **Diagnostic Testing Procedures:** Radiographs, MRI scan, CT scan.
- e. **Surgical Indications/Considerations:** Failure of non-surgical treatment when avoidance of total joint arthroplasty is desirable. For the knee, joint femoral osteotomy may be desirable for young or middle age patients with varus alignment and medial arthritis or valgus alignment and lateral compartment

arthritis. High tibial osteotomy is also used for medial compartment arthritis. Multi-compartmental degeneration is a contraindication. Patients should have a range of motion of at least 90 degrees of knee flexion. For the ankle supra malleolar osteotomy may be appropriate. High body mass is a relative contraindication.

Because smokers have a higher risk of non-union and post-operative costs, it is recommended that carriers cover a smoking cessation program peri-operatively. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels for long-term cessation.

- f. **Operative Procedures:** Peri-articular opening or closing wedge of bone, usually with grafting and internal or external fixation.

**Complications** - new fractures, lateral peroneal nerve palsy, infection, delayed unions, compartment syndrome, or pulmonary embolism.

- g. **Post-operative Treatment:**

- i. An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative. In all cases, communication between the physician and therapist is important to the timing of weight-bearing, and exercise progressions.
- ii. Weight-bearing and range-of-motion exercises depend on the type of procedure performed. Partial or full weight-bearing restrictions can range from 6 weeks partial weight-bearing, to 3 months full weight-bearing. It is usually 6 months before return to sports or other rigorous physical activity.
- iii. If femoral intertrochanteric osteotomy has been performed, there is some evidence that electrical bone growth stimulation may improve bone density. Refer to Section F., 3. Therapeutic Procedures, Non-operative, Bone Growth Stimulators for description.
- iv. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

9. **HARDWARE REMOVAL** Hardware removal frequently occurs after initial MMI. Physicians should document the possible need for hardware removal and include this as treatment in their final report on the WC 164 form.

- a. **Description/Definition:** Surgical removal of internal or external fixation device, commonly related to fracture repairs.
- b. **Occupational Relationship:** Usually following healing of a post-traumatic injury that required fixation or reconstruction using instrumentation.
- c. **Specific Physical Exam Findings:** Local pain to palpation, swelling, erythema.
- d. **Diagnostic Testing Procedures:** Radiographs, tomography, CT scan, MRI.

- e. **Surgical Indications/Considerations:** Persistent local pain, irritation around hardware.
- f. **Operative Procedures:** Removal of hardware may be accompanied by scar release/resection, and/or manipulation. Some instrumentation may be removed in the course of standard treatment without symptoms of local irritation.
- g. **Post-operative Treatment:**
  - i. An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative.
  - ii. Treatment may include therapy with or without passive therapy for progressive weight-bearing, range of motion.
  - iii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

#### 10. **RELEASE OF CONTRACTURE**

- a. **Description/Definition:** Surgical incision or lengthening of contracted tendon or peri-articular soft tissue.
- b. **Occupational Relationship:** Usually following a post-traumatic complication.
- c. **Specific Physical Exam Findings:** Shortened tendon or stiff joint.
- d. **Diagnostic Testing Procedures:** Radiographs, CT scan, MRI scan.
- e. **Surgical Indications/Considerations:** Persistent shortening or stiffness associated with pain and/or altered function.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician.
- f. **Operative Procedures:** Surgical incision or lengthening of involved soft tissue.
- g. **Post-operative Treatment:**
  - i. An individualized rehabilitation program based upon communication between the surgeon and the therapist and using therapies as outlined in Section F. Therapeutic Procedures, Non-operative.
  - ii. Treatments may include active therapy with or without passive therapy for stretching, range of motion exercises.
  - iii. Return to work and restrictions after surgery may be made by an attending physician experienced in occupational medicine in consultation with the surgeon or by the surgeon.

11. **HUMAN BONE MORPHOGENETIC PROTEIN (RhBMP)**

(RhBMP) is a member of a family of proteins which are involved in the growth, remodeling, and regeneration of bone tissue. It has become available as a recombinant biomaterial with osteo-inductive potential for application in long bone fracture non-union and other situations in which the promotion of bone formation is desired. RhBMP may be used with intramedullary rod treatment for open tibial fractures an open tibial Type III A and B fracture treated with an intramedullary rod. There is some evidence that it decreases the need for further procedures when used within 14 days of the injury. It should not be used in those with allergies to the preparation, or in females with the possibility of child bearing, or those without adequate neurovascular status or those less than 18 years old. Ectopic ossification into adjacent muscle has been reported to restrict motion in periarticular fractures. Other than for tibial open fractures as described above, it should be used principally for non-union of fractures that have not healed with conventional surgical management or peri-prosthetic fractures. Due to the lack of information on the incidence of complications and overall success rate in these situations, its use requires prior authorization. Refer to Section E 3. k, Tibial Fracture.