Shoulder Injury

Montana Utilization and Treatment Guidelines

Effective July 1, 2011

Presented by:
State of Montana

Department of Labor and Industry
EMPLOYMENT RELATIONS DIVISION

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B. General Guideline Principles

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

1. APPLICATION OF GUIDELINES The Department provides procedures to implement medical treatment guidelines and to foster communication to resolve disputes among the providers, payers, and patients through the Administrative Rules of Montana. In lieu of more costly litigation, parties may wish to request an independent medical review from the Department's Medical Director prior to submitting a Petition for a Workers' Compensation Mediation Conference.

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 shoulder pain and disability. An education-based paradigm should start with communication providing reassuring information to the patient. A more in-depth education within a treatment regime employing functional restorative and innovative programs of prevention and rehabilitation is optimal. A treatment plan should address 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 and palliative 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. FUNCTIONAL IMPROVEMENT GOALS should be consistently addressed. 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, endurance, activities of daily living, cognition, psychological behavior, and efficiency/velocity measures which 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 conditions.

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 be released to return to work with specific physical activity limitations clearly spelled out per the specific job requirement. Release to “sedentary” or “light duty” is not a specific physical limitation. The following physical limitations should be considered and modified as recommended: lifting, pushing, pulling, crouching, walking, using stairs, overhead work, 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, a health care professional with experience in ergonomics, an occupational health nurse, a physical therapist, an occupational therapist, a 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 Department 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. GUIDELINE RECOMMENDATIONS AND INCLUSION OF MEDICAL EVIDENCE 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 guidelines 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 being "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.

C. Initial Diagnostic Procedures

The Department 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 shoulder complaint are listed below.

History taking and physical examination 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.

C.1.a History of Present Injury

1. Mechanism of injury. This includes details of symptom onset and progression, and documentation of right or left dominance;

2. Relationship to work. This includes a statement of the probability that the illness or injury is work-related;

3. Prior occupational and non-occupational injuries to the same area including specific prior treatment;

4. History of locking, clicking, weakness, acute or chronic swelling, crepitation, pain while lifting or performing overhead work, dislocation or popping. Pain or catching with overhead motion may indicate a labral tear. Night time pain can be associated with specific shoulder pathology. Anterior joint pain, such as that seen in throwing athletes, may indicate glenohumeral instability. Pain radiating below the elbow, may indicate cervical disc problems or proximal entrapment neuropathy.

5. Ability to perform job duties and activities of daily living; and

6. Exacerbating and alleviating factors of the reported symptoms. The physician should explore and report on non-work related as well as, work related activities.

C.1.b Past History

1. Past medical history includes previous shoulder conditions, neoplasm, gout, arthritis, diabetes and previous shoulder symptoms;

2. Review of systems includes symptoms of rheumatologic, neurologic, endocrine, neoplastic, and other systemic diseases;

3. Smoking history; and

4. Vocational and recreational pursuits

C.1.c Physical Examination

Examination should include the elbow and neck. Both shoulders should be examined to compare asymptomatic and symptomatic sides and identify individuals with non-pathological joint laxity or degenerative rotator cuff pathology. Physical examinations should consist of accepted tests and exam techniques applicable to the joint or area being examined, including:

1. Visual inspection;
2. Palpation, including the acromio-clavicular (AC) joint, sternoclavicular joint, and the subacromial bursa in the region of the acromiohumeral sulcus;
3. Range-of-motion/quality of motion;
4. Strength, shoulder girdle weakness may indicate musculoskeletal or neurogenic pathology;
5. Joint stability;
6. Integrity of distal circulation and limited neurologic exam;
7. Cervical spine evaluation; and
8. If applicable, full neurological exam including muscle atrophy and gait abnormality.
9. Specific Shoulder Tests

This section contains a description of common clinical shoulder tests. Generally, more than one test is needed to make a diagnosis. Clinical judgment should be applied when considering which tests to perform, as it is not necessary to perform all of the listed tests on every patient. The physical examination may be non-specific secondary to multi-faceted pathology in many patients, and because some tests may be positive for more than one condition. Given the multitude of tests available, the physician is encouraged to document the specific patient response, rather than report that a test is 'positive.' The tests are listed for informational purposes, and are also referenced in Section E of this document, Specific Diagnostic, Testing and Treatment Procedures.

A) Rotator cuff/Impingement tests/Signs
Most published clinical examination studies assess rotator cuff pathology. There is some evidence that tests are reliable for ruling out diagnoses, but not necessarily defining the pathology accurately. Some studies indicate that the Neer test, Hawkins test, Jobe test, crossed-arm adduction test, impingement sign and arc of pain are approximately 80% sensitive for impingement or rotator cuff pathology. The drop arm, Yergason’s, Speed, and passive external Rotation Tests are thought to have specificity of 60% or higher. (Questions remain about interrater reliability.)

1. Weakness with abduction.

2. Arc of pain – Pain with 60 to 120 degrees of abduction.

3. Neer impingement sign – Examiner flexes arm anteriorly to reproduce impingement. Positive if pain is reproduced.

4. Neer impingement test – When the Neer impingement sign is positive, the subacromial bursa is injected with local anesthetic. If, after 40 minutes, the patient has sufficient pain relief so that the examiner can perform the Neer impingement sign without recreating the initial pain, the test suggests impingement.

5. Hawkins - arm is abducted to 90 degrees, forward flexed by 90 degrees with elbow flexed. Examiner internally rotates the humerus. Pain suggests impingement.

6. Drop arm - Patient slowly lowers arm from full abduction. If the arm drops, or if the patient is unable to maintain slow progress from approximately 90 degrees, the test suggests rotator cuff tear.

7. Lift off - patient's hand is placed against back of waist with 90 degrees flexion of elbow. The patient is asked to lift the hand off of his back at waist level. If the hand drops to the initial position against the back, this suggests subscapularis tear or weakness. Some patients may not be able to perform the initial hand placement due to pain or limited range-of-motion.

8. Subscapularis strength test - Patient places hand on mid-abdomen, and then applies pressure. If the elbow moves posteriorly or the wrist flexes, the test suggests subscapularis weakness or tear.

9. Empty Can test - Patient's arm abducted to 60 to 90 degrees with 30 degrees forward flexion and with forearm pronated. Thumbs are pointing toward the floor. Patient resists examiner's downward pressure on the elbow. Weakness of the affected side, compared to the opposite side, or pain in subacromial area suggests supraspinatus tear, tendonitis or tendonosis.

10. External rotation lag test - the patient's arm is abducted to 20 degrees with elbow flexed at 90 degrees, and almost fully externally rotated. If the patient cannot maintain the arm in external rotation, this suggests a supraspinatus and/or infraspinatus tear.

11. External rotation weakness – Elbows are flexed with arms at side, and patient attempts to externally rotate against resistance. Weakness suggests infraspinatus and teres minor pathology.

12. Impingement sign – Patient extends shoulder, then abducts and reports any pain.

B) Acromioclavicular Joint Tests

1. Crossed arm adduction – Examiner adducts arm across the body as far as possible toward the opposite shoulder. If patient reports pain in the AC joint, this suggests AC joint pathology. Examiner may measure the distance between antecubital fossa and the

opposite acromion of the opposite shoulder. If one shoulder demonstrates increased distance compared to the other shoulder, this suggests a tight posterior capsule.

2. Paxino's - The examiner's thumb is placed under the posterolateral aspect of the acromion, with the index and long fingers on the superior aspect of middle part of the clavicle. Examiner applies anterior superior pressure to acromion with thumb, and pushes inferiorly on the middle of the clavicle with index and long fingers. If the patient reports increased pain in the AC joint, the test suggests AC joint pathology.

C) Labral Tears

Labral tears which may require treatment usually occur with concurrent bicipital tendon disorders pathology and/or glenohumeral instability. Therefore, tests for labral pathology are included in these sections.

D) Bicipital Tendon Disorders

1. Yergason's Test -The patient has the elbow flexed to 90 degrees. The examiner faces the patient, grasps the patient's hand with one hand and palpates the bicipital groove with the other. The patient supinates the forearm against resistance. If the patient complains of pain in the biceps tendon with resistance, it suggests a positive finding.

2. Ludington's - The patient's hands are placed behind the head, with the shoulders in abduction and external rotation. If biceps contraction recreates pain, the test suggests biceps tendon pathology.

3. Speed Test - The patient's shoulder is flexed to 90 degrees and supinated. The examiner provides resistance to forward flexion. If pain is produced with resistance, the test suggests biceps tendon instability or tendonitis.

4. Biceps Load Test II - The patient is supine with the arm elevated to 120 degrees, externally rotated to maximum point, with elbow in 90 degrees of flexion and the forearm supinated. The examiner sits adjacent to the patient on the same side, and grasps the patient's wrist and elbow. The patient flexes the elbow, while the examiner resists. If the patient complains of pain with resistance to elbow flexion, or if the pain is increased with resisted elbow flexion, this may suggest a biceps related SLAP lesion in young patients.

E) Glenohumeral Instability/Labral Tears/SLAP Lesions

Many of the following tests are also used to test for associated labral tears. The majority of the tests/signs should be performed on both shoulders for comparison. Some individuals have increased laxity in all joints, and therefore, tests/signs which might indicate instability in one individual may not be pathologic in individuals whose asymptomatic joint is equally lax.

1. Sulcus sign – With the patient's arm at the side, the examiner pulls inferiorly and checks for deepening of the sulcus, a large dimple on the lateral side of the shoulder. Deepening of the sulcus suggests instability.

2. Inferior instability – With patient's arm abducted to 90 degrees, examiner pushes down directly on mid-humerus. Patient may try to drop the arm to the side to avoid dislocation.

3. Posterior instability – The patient's arm is flexed to 90 degrees anteriorly and examiner applies posterior force to the humerus. The examiner then checks for instability.

4. Apprehension – Patient's shoulder is in 90 degrees of abduction and in external rotation. Examiner continues to externally rotate and apply axial force to the humerus. If there is pain, or if patient asks to stop, the test suggests anterior instability.

5. Relocation – Examiner applies posterior force on humerus while externally rotating. This is performed in conjunction with the apprehension test. If symptoms are reduced, the test suggests anterior instability.

6. Load and shift or anterior and posterior drawer – Patient is supine or seated with arm abducted from shoulder from 20 to 90 degrees and elbow flexed. Humerus is loaded by examiner, then examiner attempts to shift the humeral head anterior, posterior, or inferior. Both shoulders should be tested. Results are graded using:

    1. Grade 0, little or no movement;

    2. Grade 1, humeral head glides beyond the glenoid labrum; and

    3. Grades 2 & 3 actual dislocation of the humeral head off the glenoid.

7. Anterior slide or Kibler test – Patient places hands on hips with thumb directed posteriorly. Examiner applies force superiorly and anteriorly on the humerus, while the patient resists. If a click or deep pain results, test suggests labral tear.

8. Active compression (O'Brien) test – The patient has the shoulder in 90 degrees flexion and 10 to 15 degrees adduction. The arm is internally rotated so the thumb is pointing downward. The patient elevates the arm while the examiner resists. If the patient experiences deep anterior shoulder pain that is relieved when the same process is repeated with external rotation of the arm, the test suggests labral tear or AC joint pathology.

9. Crank test – The patient is standing and has arm elevated to 160 degrees in the scapular plane. The examiner loads the glenohumeral joint while the arm is passively rotated internally and externally. The test is repeated in the supine position. Pain, clicking, popping, or other mechanical grinding suggests labral tear and possible instability.

10. Compression rotation test –The patient is supine with shoulder abducted at 90 degrees. The examiner applies an axial load across the glenohumeral joint while simultaneously passively rotating the patient's arm in internal and external rotation. Pain, clicking, popping, or other mechanical grinding suggests a labral tear and possible instability.

11. Pain provocation or Mimori test – The patient is seated upright with the shoulder in 90 degrees abduction. The examiner maximally pronates and supinates the forearm while

maintaining the shoulder at 90 degrees abduction. A positive test is suggested when pain or pain severity, is greater with the forearm pronated.

Functional assessment. The provider should assess the patient's functional skills initially and periodically during treatment. The initial exam will form the baseline for the patient's functional abilities post- injury. This assessment will help the physician and patient determine when progress is being made and whether specific therapies are having a beneficial effect. A number of functional scales are available that have been validated in clinical research settings. Many of these scales were developed to evaluate specific diagnoses and will not be useful for all patients with shoulder pain. The following areas are examples of functional activities the provider may assess:

- Interference with sleep;
- Difficulty getting dressed or combing or washing hair;
- Ability to do the household shopping alone;
- Ability to shower or bath and dry oneself using both hands;
- Ability to carry a tray of food across a room with both hands;
- Ability to hang up clothes in the closet;
- Ability to reach high shelves with the affected shoulder;
- Difficulty with any other activities including sports and work duties;
- Concerns about putting on overhead clothing;
- Concerns that a specific activity might cause the shoulder to "go out";
- A detailed description of ability to perform job duties.

Any positive historical information should be validated by the provider's physical exam.

C.1.d Assessing Red Flags

Physical examination evidence of septic arthritis, neurologic compromise, cardiac disease, or intra-abdominal pathology that correlates with the medical history and test results may indicate a need for immediate consultation. Consultation may further reinforce or reduce suspicions of tumor, infection, fracture, or dislocation. A medical history that suggests pathology originating in a part of the body other than the shoulder might warrant examining the cardiovascular and respiratory systems, abdomen, or other areas. Painless full ROM of the shoulder suggests referred pain.

Refer to Table: Red Flags for Potentially Serious Shoulder Conditions.

Table: Red Flags for Potentially Serious Shoulder Conditions		
Disorder	Medical History	Physical Examination
Fractures	History of significant trauma (e.g., direct, deceleration, slip, trip, fall, motor vehicles) Severe pain and inability to move the shoulder	Generally severe pain Inability to move or use the arm and shoulder Significant bruising or hemarthrosis Deformity consistent with displaced fracture (with fracture, check for pulmonary injury and rib fracture as well) Significant swelling
Dislocation (glenohumeral joint)	History of significant trauma History of prior dislocation Presence of deformity, some with history of spontaneous reduction or self-reduction Severe pain and inability to move the shoulder	Deformity consistent with unreduced dislocation Anterior more common than posterior Inability or reduced ability to move the shoulder
Infection	History of systemic symptoms of infection (e.g., fevers, chills) Persistent, severe shoulder pain May have other, distant sites with symptoms of infection Diabetes mellitus History of immunosuppression (e.g., transplant, chemotherapy, HIV)	Limited range of motion due to severe pain Systemic signs of sepsis (elevated temperature, chills, hypotension, tachycardia) If AC joint, will usually have effusion, tenderness and may have overlying erythema. If subacromial, may have erythema and swelling. If glenohumeral joint, often no findings other than limited shoulder range of motion and pain.
Tumor	Pain at rest History of smoking or other risk factor History of any cancer present or prior (especially lung) History of immunosuppression (transplant, chemotherapy, HIV)	Palpable mass Tumor vessels Distant findings of cancer Compression neuropathy (see Neurologic compromise)

C.2 Radiographic Imaging

Radiographic Imaging of the shoulder 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 for most non-traumatic diagnoses. 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, refer to Section E, Specific Diagnosis, Testing and Treatment Procedures. Indications include:

1. Inability to actively move arm through range-of-motion;

2. History of significant trauma, especially blunt trauma or fall from a height;

3. History of dislocation;

4. Age over 55 years;

5. Unexplained or persistent shoulder pain over two weeks. (Occult fractures, may not be visible on initial x-ray. A follow-up radiograph and/or bone scan may be required to make the diagnosis);

6. History or exam suggestive of intravenous drug abuse or osteomyelitis; and

7. Pain with swelling and/or range-of-motion (ROM) limitation localizing to an area of prior fracture, internal fixation, or joint prosthesis.

C.3 Laboratory Tests

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 Department 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:

1. Completed Blood Count (CBC) with differential can detect infection, blood dyscrasias, and medication side effects;

2. Erythrocyte sedimentation rate, rheumatoid factor, antinuclear antigen (ANA), human leukocyte antigen (HLA), and C-reactive protein can be used to detect evidence of a rheumatologic, infection, or connective tissue disorder;

3. Serum calcium, phosphorous, uric acid, alkaline phosphatase, and acid phosphatase can detect metabolic bone disease;

4. Liver and kidney function may be performed for prolonged anti-inflammatory use or other medications requiring monitoring; and

5. Analysis of joint aspiration for bacteria, white cell count, red cell count, fat globules, crystalline birefringence and chemistry to evaluate joint effusion.

C.4 Other Procedures

Joint Aspiration: is a generally accepted, well-established and widely used procedure when specifically indicated and performed by individuals properly trained in these techniques. Especially, when history and/or physical examination are of concern for a septic joint or bursitis. 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.

D. Follow-up Diagnostic Imaging and Testing Procedures

One diagnostic imaging procedure may provide the same or distinctive information as does another procedure. Therefore, the prudent choice of a single diagnostic procedure, a complement of procedures or a sequence of procedures will optimize diagnostic accuracy; maximize cost effectiveness (by avoiding redundancy), and minimize potential adverse effects to patients.

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 form the basis for selecting an imaging procedure and interpreting its results.

When a diagnostic procedure, in conjunction with clinical information, can provide 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.

D.1 Imaging Studies

Imaging studies are generally accepted, well-established and widely used diagnostic procedures. When indicated, the following additional imaging studies can be utilized for further evaluation of the shoulder, based upon the mechanism of injury, symptoms, and patient history. For specific clinical indications, refer to Section E, Specific Diagnosis, Testing and Treatment Procedures. The studies below are listed by frequency of use, not importance.

Diagnostic imaging may be useful in resolving the diagnostic uncertainties that remain after the clinical examination. Even a thorough history and physical examination may not define the shoulder pathology that produces the patient's symptoms. Therefore, additional investigations should be considered as an accepted part of the patient evaluation when surgery is being considered or clarification of diagnosis is necessary to formulate a treatment plan.

D.1.a X-ray

X-ray is widely accepted and frequently the first imaging study performed. Three radiographically distinguishable acromion types have been described: Type I (flat), Type II (curved), and Type III (hooked). Historically, acromion type was correlated with incidence of rotator cuff pathologies and with outcome of nonsurgical treatment of shoulder pain. However, there is considerable variation between observers regarding the acromial types, both in interpreting plain x-rays and in classifying anatomical specimens. Acromial morphology should not be used to assess the likelihood of rotator cuff pathology. Acromial morphology alone should not be considered an indication for acromioplasty, as up to 40% of asymptomatic adults may have a Type II acromion. Appropriate soft tissue imaging techniques such as sonography and MRI should be used to assess rotator cuff or bursa status.

D.1.b Diagnostic Sonography

Diagnostic Sonography is an accepted technique for suspected full-thickness tears. A positive sonogram has a high specificity of 96% and provides convincing confirmation of the diagnosis. Sensitivity is high, 87%, however, negative sonography does not rule out a full-thickness tear. For partial thickness tears, a positive sonogram has high specificity, 94%, but is only moderately sensitive, 67%. A negative sonogram does not exclude the diagnosis of a partial thickness tear. The performance of sonography is operator-dependent, and is best when done by a specialist in musculoskeletal radiology. It is preferable to MRI when the patient is claustrophobic or has inserted medical devices.

D.1.c Magnetic Resonance Imaging (MRI)

Magnetic Resonance Imaging (MRI) is generally accepted and widely used to provide a more definitive visualization of soft tissue structures, including ligaments, tendons, joint capsule, and joint cartilage structures, than x-ray or Computed Axial Tomography (CT) in the evaluation of traumatic or degenerative injuries. The addition of intravenous or intra-articular contrast can enhance definition of selected pathologies.

In general, the high field, conventional, MRI provides better resolution than a low field scan. 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. All questions in this regard should be discussed with the MRI center and/or radiologist.

MRI provides excellent soft tissue detail, but interpretation of the image is problematic and depends on operator skill. A positive MRI has high specificity of 93% and provides supporting evidence that a clinical suspicion of a full-thickness tear is correct. Sensitivity of MRI for full-thickness tears is also high at 89%. However, it may not identify the pathology in some cases. For partial thickness tears, sensitivity of MRI is below 50%, but its specificity is high at 90%.

D.1.d Computed Axial Tomography (CT)

Computed Axial Tomography (CT) is generally accepted and provides excellent visualization of bone and 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.1.e Helical CT scans

Helical CT scans: sometimes used for diagnosing osteonecrosis. Helical CT scanning has been largely replaced by MRI. However, there are patients who have contraindications for MRI (e.g., implanted ferrous metal) helical CT is recommended.

Helical CT scan has been thought to be superior to MRI for evaluating subchondral fractures; however, a definitive study has not been reported. Helical CT has few if any adverse effects, but is costly. It is recommended for select use.

D.1.f MR Arthrography (MRA)

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 can accurately demonstrate and rule out full-thickness tears as well as non-contrast MRI, but it is invasive and its place in the evaluation of rotator cuff pathology has not been determined. In select populations of highly active athletes, it may uncover unsuspected labral pathology such as SLAP lesions, but the arthroscopically normal labrum may produce an abnormal signal in half of MRA studies. Its contribution to the diagnosis of SLAP lesions has not been determined. An MRA is not necessary if the patient has already met indications for arthroscopy or surgery as outlined in Section E. However, an MRA may be ordered when the surgeon desires further information prior to surgery.

D.1.g Venogram/Arteriogram

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

D.1.h Bone Scan (Radioisotope Bone Scanning)

Bone Scan (Radioisotope Bone Scanning) is generally accepted, well-established and widely used. Bone scanning is more sensitive but less specific than MRI. 99MTechnecium 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, Complex Regional Pain Syndrome, and suspected neoplastic conditions of the upper extremity.

D.1.i Other Radioisotope Scanning

Other Radioisotope Scanning Indium and gallium scans are generally accepted procedures usually to help diagnose lesions seen on other diagnostic imaging studies. 67Gallium citrate scans are used to localize tumor, infection, and abscesses. 111Indium-labeled leukocyte scanning is utilized for localization of infection or inflammation.

D.1.j Arthrograms

Arthrograms are accepted; however, rarely used except for evaluation of patients with metal implants and previous shoulder surgery.

D.2 Other Tests

The following diagnostic procedures in this subsection are listed in alphabetical order.

D.2.a Antibody Levels

There are numerous antibodies that are markers for specific rheumatic diseases (e.g., rheumatoid factor, anti-nuclear antibodies, anti-Sm, anti-Ro, anti-La for rheumatoid arthritis, systemic lupus erythematosus, Sjogren's, mixed connective tissue disorder, etc.). Patients with rheumatic disorders are at increased risk for degenerative joint disease of the shoulder as well as subacromial bursitis.

Antibody levels are strongly recommended as a screen to confirm specific disorders (e.g., rheumatoid arthritis). However, routine use of these tests in shoulder pain patients is not recommended, especially as wide-ranging, non-focused test batteries are likely to result in inaccurate diagnoses due to false positives and low pre-test probabilities. Providers should also be aware that false-negative results occur. Measurement of antibody levels is minimally invasive, unlikely to have substantial adverse effects, and is low to moderately costly depending on the specific test ordered

D.2.b Compartment Pressure Testing and Measurement Devices

Compartment Pressure Testing and Measurement Devices such as pressure manometer, are generally accepted and useful in the evaluation of patients who present uncommon but reported symptoms consistent with a compartment syndrome.

D.2.c Diagnostic Arthroscopy (DA)

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

In other cases, in which imaging tests are negative and the patient has failed to improve functionally despite active participation in non-operative therapy, DA may be indicated to clarify the diagnosis.

Usually tissue pathology is unnecessary for diagnostic accuracy. However, some institutions may require gross tissue pathology.

D.2.d Doppler Ultrasonography/Plethysmography

Doppler Ultrasonography/Plethysmography is useful in establishing the diagnosis of arterial and venous disease in the upper extremity and should be considered prior to the more invasive venogram or arteriogram study.

D.2.e Electrodiagnostic Testing

Electrodiagnostic tests include but are not limited to, Electromyography (EMG), and Nerve Conduction Studies (NCS). These are generally accepted, well-established and widely used

diagnostic procedures. Electrodiagnostic studies may be useful in the evaluation of patients with suspected involvement of the neuromuscular system, including radiculopathies, peripheral nerve entrapments, peripheral neuropathies, disorders of the neuromuscular junction and primary muscle disease. EMGs should not be routinely performed for shoulder injuries unless there are findings to suggest new diagnostic pathology (Refer to Section E.4 Brachial Plexus).

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 not be obtainable from standard radiologic studies.

Portable Automated Electrodiagnostic Device (also known as Surface EMG) is not a substitute for conventional EMG/NCS testing in clinical decision-making, and therefore, is not recommended.

D.2.f Personality/Psychological/Psychosocial Evaluations

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

1. Employment history;
2. Interpersonal relationships — both social and work;
3. Leisure activities;
4. Current perception of the medical system;
5. Results of current treatment;
6. Perceived locus of control; and
7. 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. A professional fluent in the primary language of the patient is strongly preferred. When such a provider is not available, services of a professional language interpreter must be provided. When issues of chronic pain are identified, the evaluation should be more extensive and follow testing procedures as outlined in the Department'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.

D.3 Special Tests

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.

D.3.a Computer Enhanced Evaluations

Computer Enhanced Evaluations may include isotonic, isometric, isokinetic and/or isoinertial measurement of movement, range-of-motion (ROM), 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. The added value of computer enhanced evaluations is unclear. Targeted work tolerance screening or gradual return to work is preferred.

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

D.3.b Functional Capacity Evaluation (FCE)

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.

- 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.

D.3.c Jobsite Evaluation

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. 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:

1. To determine if there are potential contributing factors to the person’s condition and/or for the physician to assess causality;

2. To make recommendations for, and to assess the potential for ergonomic changes;

3. To provide a detailed description of the physical and cognitive job requirements;

4. 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

5. To give detailed work/activity restrictions.

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

D.3.d Vocational Assessment

Vocational Assessment If the injury is such that the practitioner can easily determine that the worker will be unable to return to his/her previous occupation, then vocational rehabilitation assistance at that time may aid in the overall medical management and rehabilitation of the patient. The physician may decide that the patient is unable to return to the previous occupation prior to declaration of Maximum Medical Improvement (MMI).

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 physician should have identified the expected permanent limitation(s) prior to the assessment. Declaration of MMI 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.

D.3.e Work Tolerance Screening

Work Tolerance Screening is a determination of an individual's tolerance for performing a specific job based on a job activity or task and may be used when a full Functional Capacity Evaluation is not indicated. The screening is monitored by a therapist and 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.

- 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 Diagnosis, Testing and Treatment Procedures

E1. Acromioclavicular Joint Sprains/Dislocations

An acute acromioclavicular (AC) joint injury is frequently referred to as a shoulder separation. There are six classifications of AC joint separation, which are based upon the extent of ligament damage and bony displacement

E.1.a Description/Definition

Type I Sprain of the AC ligament and capsule; x-ray usually normal.

Type II Sprains consisting of a ruptured AC ligament and capsule with incomplete injury to the coracoclavicular (CC) ligament, resulting in mild AC joint subluxation. X-ray shows clavicle slightly elevated.

Type III Dislocation of the clavicle above the acromion with complete tear of the AC ligament and/or CC ligaments; abnormal stress x-rays.

Type IV Dislocation consisting of a displaced clavicle that penetrates posteriorly through or into the trapezius muscle. The sterno-clavicular joint may also be dislocated.

Type V Dislocation consisting of complete separation of the AC and CC ligaments and dislocation of the acromioclavicular joint with a large coracoclavicular interval.

Type VI Dislocation consisting of a displaced clavicle that penetrates inferior to the coracoid.

Type I-III are common, while Types IV-VI are not, and when found require surgical consultation. For AC joint degeneration from repetitive motion that is found to be work-related, refer to Section E. 8, Impingement Syndrome.

E.1.b Occupational Relationship

Generally, workers sustain an AC joint injury when they fall landing on the point of the shoulder, driving the acromion downward; or fall on an outstretched hand or elbow with an adducted arm, creating a backward and outward force on the shoulder. It is important to rule out other sources of shoulder pain from the acute injury, including rotator cuff tear, fracture, and nerve injury.

E.1.c Specific Physical Exam Findings

Specific Physical Exam Findings may include the following:

1. At times, tenderness at the AC joint with contusions and/or abrasions at the joint area; and/or prominence/asymmetry of the shoulder can be seen;

2. The patient usually demonstrates decreased shoulder motion, and with palpation, the distal end of the clavicle is painful. There may be increased clavicular translation and cross-body adduction that causes exquisite pain at the AC joint. Cross-body adduction with the arm elevated to 90 degrees can also cause posterior pain with a tight posterior capsule, or lateral pain with impingement. Injection of local anesthetic in the AC joint should relieve pain when performing this maneuver.

E.1.d Diagnostic Testing Procedures

Plain x-rays may include:

1. AP view;

2. AP radiograph of the shoulder with the beam angled 10 degrees cephalad (Zanca view) and a beam strength that is under-penetrating;

3. Axillary lateral views; and

4. Stress view; side-to-side comparison with 10 to 15 lb. of weight in each hand.

E.1.e Non-operative Treatment Procedures

Non-operative Treatment Procedures may include:

1. Procedures outlined in Section F. Immobilization in some cases (up to 6 weeks for Type I-III AC joint separations). Treatments for Type III injuries are controversial and may range from a sling to surgery.

2. Medication, such as non-steroidal anti-inflammatories and analgesics would be indicated. Narcotics are not normally indicated. Lidocaine patches may be used for pain relief. In chronic acromioclavicular joint pain, a series of injections with or without cortisone may be performed up to 3 times per year.

3. Benefits may be achieved through therapeutic rehabilitation. It should emphasize a progressive increase in range-of-motion (ROM) without exacerbation of the AC joint injury. Full recovery of AC joint dislocation may require up to twelve weeks. With increasing motion and pain control, a strengthening program should be instituted. Refer to Section F, Therapeutic Procedures, Non-operative.

4. Return to appropriate modified duty should begin within the first week. Refer to Section F. 12, Return to Work. With restoration of full-motion, return to full-duty should be anticipated within 3 months.

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

E.1.f Surgical Indications

Patients who have Type III AC joint dislocations will usually recover well without surgical intervention. Surgical intervention may be considered when functional deficits interfere with activities of daily living and/or job duties after three to four months of active patient participation in non-operative therapy. For patients with particularly high physical demands on their shoulder, immediate orthopaedic consultation with surgical intervention as early as two weeks from the date of injury may be considered.

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. The patient should also agree to comply with the pre- and post-operative treatment plan and home exercise requirements and understand the length of partial and full-disability expected post-operatively.

With a Type IV-VI AC joint injury, an orthopedic surgical consultation is recommended.

E.1.g Operative Procedures

AC joint stabilization with or without distal clavicle resection. Distal clavicle resection may prevent painful arthritis but can compromise post-operative AC joint stabilization.

E.1.h Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F-Therapeutic Procedures, Non-operative. Early therapeutic rehabilitation interventions are recommended to maintain ROM with progressive strengthening.

- Frequency: 3 to 5 times per week for the first 2 weeks, 3 times per week for the following 2 weeks, then 1 to 2 times per week.
- Optimum Duration: 6 to 8 weeks with progression to home exercise and/or pool therapy.
- Maximum Duration: 12 weeks. Occasional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

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

E2. Adhesive capsulitis/Frozen Shoulder Disorder

E.2.a Description/Definition

Adhesive capsulitis of the shoulder, also known as frozen shoulder disorder, is a soft tissue lesion of the glenohumeral joint resulting in global restrictions of passive and active ROM. Lack of passive ROM can persist even with therapy, for an average of 30 months. The disorder

progresses through stages, specifically:

Stage 1-Consists of acute pain with some limitation in range-of-motion; generally lasting 2 to 9 months.

Stage 2-Characterized by progressive stiffness, loss of passive range-of-motion, muscular atrophy, and decreased pain; generally lasting an additional 3 to 12 months beyond Stage 1.

Stage 3-Characterized by partial or complete resolution of symptoms and restoration of ROM and strength; it usually takes an additional 5 to 26 months beyond Stage 2.

Patients will usually complain of pain in the sub-deltoid region, but occasionally over the long head of the biceps or radiating down the lateral aspect of the arm to the forearm. Pain is often worse at night, with difficulty sleeping on the involved side. Motion is restricted and painful.

In Stages 2 and 3, patients may also experience peri-scapular and neck pain from compensatory scapular thoracic motion.

Idiopathic adhesive capsulitis usually occurs spontaneously without any specific inciting injury. This occurs most frequently in diabetic, middle aged patients. This type of adhesive capsulitis is likely to remit over time and is usually not work related.

Capsulitis or stiffness may occur secondary to trauma or surgery from another condition. Therapy and additional treatment recommendations for other specific diagnoses should be strictly followed to decrease the occurrence of secondary restricted ROM.

E.2.b Occupational Relationship

There should be some history of work related injury. Occupational adhesive capsulitis may arise secondary to any chest or upper extremity trauma. Primary adhesive capsulitis is rarely occupational in origin.

E.2.c Specific Physical Exam Findings

Specific Physical Exam Findings may include:

Restricted active and passive glenohumeral ROM in multiple planes is the primary physical finding. It may be useful for the examiner to inject the subacromial space with lidocaine and then repeat ROM testing to rule out stiffness secondary to rotator cuff or bursal pathology. Lack of improvement of ROM usually confirms the diagnosis. Postural changes and secondary trigger points along with atrophy of the deltoid and supraspinatus muscles may be seen.

E.2.d Diagnostic Testing Procedures

1. Plain x-rays should be done to rule out concomitant pathology such as subluxation or tumor.

2. Other diagnostic testing may be indicated to rule out associated pathology. Refer Section D., Follow-up Diagnostic Procedures and to Section E., Specific Diagnosis, Testing, and Treatment. Dynamic sonography may be useful to specifically identify the movements most affected and rule out other pathology.

3. Laboratory tests should be considered to rule out systemic diseases.

E.2.e Non-operative Treatment Procedures

Address the goal to restore and maintain function and may include the following:

i. Therapeutic interventions are the mainstay of treatment. They should include ROM, active therapies, 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 instruction in a home exercise program targeted to further improve ROM and strength of the shoulder girdle musculature. There is some evidence that a home exercise program will have similar results to fully-supervised physical therapy in non-workers compensation populations; however, to facilitate return to work, supervised therapy is generally recommended for at least several sessions to assure proper performance of home exercise and to evaluate continued progress. These sessions are in addition to any sessions already performed for the original primary related diagnosis. Refer to Section F, Therapeutic Procedures, Non-operative for all other therapies as well as a description of active and passive therapies.

- Time to Produce Effect: 4 sessions.
- Frequency: 2 times per week for the first 2 weeks and 1 time or less thereafter.
- Optimum Duration: 8 to 12 sessions.
- Maximum Duration: 20 sessions per year. Additional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if therapy to date has demonstrated objective functional gains.

ii. Return to work duties with increased ROM as tolerated are also helpful to increase function. Refer to Section F. 12, Return to Work.

iii. Medications, such as NSAIDS and analgesics, may be helpful. Narcotics are indicated for post-manipulation or post-operative cases. Judicious use of pain medications to optimize function may be indicated. Refer to Section F.6., Medications.

iv. Subacromial bursal and/or glenohumeral steroid injections can decrease inflammation and allow the therapist to progress with functional exercise and ROM. There is strong evidence that intra-articular injection of a corticosteroid produces pain relief and increases ROM in the short-

term for individuals with restriction of both active and passive ROM in more than one direction. There is good evidence that the addition of a physical therapy or home exercise program is more effective than steroid injections alone. 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.
Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose level at least daily for 2 weeks after injections.

- Time to Produce Effect: One injection.
- Maximum Duration: 3 injections in one year at least 4 to 8 weeks apart, when functional benefits are demonstrated with each injection.

v. There is no clear long-term benefit for suprascapular nerve blocks, however, blocks may be appropriate for patients when pain is not well-controlled and injections improve function.

- Time to Produce Effect: One block should demonstrate increased ability to perform exercises and/or range-of-motion.
- Maximum Duration: 3 per year.

vi. In cases that are refractory to conservative therapy lasting at least 3 to 6 months, and in whom ROM remains significantly restricted (abduction usually less than 90 degrees), the following treatment may be considered:

- Distension arthrography or “brisement” in which saline, an anesthetic and usually a steroid are forcefully injected into the shoulder joint causing disruption of the capsule. There is good evidence that distension arthrogram with steroid and saline improves function in patients with decreased passive ROM after 3 months of treatment. Early therapy to maintain ROM, and restore strength and function should follow distension arthrography. Return to work with restrictions should be expected within one week of the procedure; return to full-duty is expected within 4 to 6 weeks.
- Dynamic splinting may be appropriate for rare cases when a functional ROM has not been achieved with the treatment listed above.

vii. There is no evidence that hyaluronate injections are superior to physical therapy in this condition and are not recommended.

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

E.2.f Surgical Indications

Surgery may be considered when functional deficits interfere with activities of daily living and/or job duties after 3 to 6 months of active patient participation in non-operative therapy. For most individuals this constitutes limitations in the range of 130 degrees elevation and 120 degrees abduction; with significant functional limitations; however, individuals who must perform overhead work and lifting may require a greater ROM.

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. The patient should also agree to comply with the pre- and post-operative treatment plan and home exercise requirements. The patient should understand the length of partial and full disability expected post-operatively.

E.2.g Operative Procedures

Manipulation under anesthesia which may be done in combination with steroid injection, distension arthrography, or arthroscopy. Contraindications to closed manipulation under anesthesia include anti-coagulation or bleeding diatheses, significant osteopenia, or recent surgical repair of shoulder soft tissue, fracture or neurological lesion. Complications may include humeral fracture, dislocation, cuff injuries, labral tears or brachial plexus injury.

Arthroscopic capsular release or open surgical release may be appropriate in rare cases with failure of previous methods and when the patient has demonstrated ability to follow through with required physical and occupational therapy. Other disorders, such as impingement syndrome, may also be treated at the same time. Radiofrequency is not recommended due to reported complications from chondrolysis.

E.2.h Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F-Therapeutic Procedures, Non-operative. Therapy may include the following:

Early therapeutic rehabilitation interventions are recommended to maintain ROM and should progress to strengthening exercises.

- Frequency: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks, 3 times per week for the following 2 weeks, then 1 to 2 times per week. The exact frequency per week will depend on the severity.
- Optimum Duration: 6 to 8 weeks with progression to home exercise and/or pool therapy.
- Maximum Duration: Up to 12 weeks. Additional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

Return to work and restrictions after surgery may be made by an experienced primary

occupational medicine physician in consultation with the surgeon or by the surgeon.

Patient should be approaching MMI within 8 to 12 weeks post-operatively; however, co-existence of other pathology should be taken into consideration.

E3. Bicipital Tendon Disorders

E.3.a Description/Definition

Disorders may include: 1) primary bicipital tendonopathy, which is exceedingly rare; 2) secondary bicipital tendonopathy, which is generally associated with rotator cuff tendonitis or impingement syndrome (see appropriate diagnosis subsections); 3) subluxation of the biceps tendon, which occurs with dysfunction of the transverse inter-tubercular ligament and rotator cuff tears; and 4) acute disruption of the tendon, which can result from an acute distractive force or transection of the tendon from direct trauma.

Symptoms may include aching, burning and/or stabbing pain in the shoulder, usually involving the anterior medial portion of the shoulder girdle. The symptoms are exacerbated with above-the-shoulder activities and those specifically engaging the biceps (flexion at the shoulder, flexion at the elbow and supination of the forearm). Relief occurs with rest. Patients may report nocturnal symptoms which interfere with sleep during the acute stages of inflammation; pain and weakness in shoulder during activities; repeated snapping phenomenon with a subluxing tendon; immediate sharp pain and tenderness along the course of the long head of the biceps following a sudden trauma which would raise suspicions of acute disruption of the tendon; and/or with predominant pain at the shoulder accompanied by referral patterns which may extend pain into the cervical or distal structures, including the arm, elbow, forearm, and wrist.

E.3.b Occupational Relationship

Bicipital tendon disorders may include symptoms of pain and/or achiness that occur after repetitive use of the shoulder and/or blunt trauma to the shoulder. Secondary bicipital tendonitis may be associated with prolonged above-the-shoulder activities, and/or repeated shoulder flexion, external rotation and abduction. Acute trauma to the biceps tendon of the shoulder girdle may also give rise to occupational injury of the biceps tendon.

Occupational disorders of the biceps tendon may accompany scapulothoracic dyskinesis, rotator cuff injury, AC joint separation, sub deltoid bursitis, shoulder instability or other shoulder pathology. Symptoms should be exacerbated or provoked by work that activated the biceps muscle. Symptoms may be exacerbated by other activities that are not necessarily work related and the physician should explore and report these areas.

E.3.c Specific Physical Exam Findings

Specific Physical Exam Findings may include the following:

1. If continuity of the tendon has been lost (biceps tendon rupture), inspection of the shoulder would reveal deformity (biceps bunching/Popeye deformity). It is important to

differentiate between distal and proximal tendon rupture, as distal biceps ruptures often require urgent intervention.

2. Palpation demonstrates tenderness along the course of the bicipital tendon.

3. Pain at end range of flexion and abduction as well as with biceps tendon activation.

4. Provocative testing may include the following (a detailed description of the signs and tests is located in initial diagnostic procedures):

    - Yergeson's sign.
    - Speed's Test.
    - Ludington's Test.

E.3.d Diagnostic Testing Procedures

Plain x-rays include:

A) Anterior/Posterior (AP) view. Elevation of the humeral head is indicative of a rotator cuff tear;
B) Lateral view in the plane of the scapula or an axillary view determines an anterior or posterior dislocation or the presence of a defect in the humeral head (a Hill-Sachs lesion);
C) Axillary view is also useful to demonstrate arthritis and spurs on the anterior inferior acromion; and
D) Outlet view determines if there is a downwardly tipped acromion.

Adjunctive testing, such as sonography, or MRI should be considered when shoulder pain is refractory to 4 to 6 weeks of non-operative conservative treatment and the diagnosis is not readily identified by standard radiographic and clinical techniques.

E.3.e Non-operative Treatment Procedures

i. Benefit may be achieved through procedures outlined in Section F, Non-operative Treatment Procedures, such as appropriate modalities, limited acute immobilization, exercise and evaluation of occupational workstation. Therapy should emphasize progressive increase in ROM. With increasing motion and pain control, a strengthening program should be instituted.

- Time to Produce Effect: 4 sessions.
- Frequency: 2 times per week for the first 2 weeks and 1 time or less thereafter.
- Optimum Duration: 8 to 12 sessions.
- Maximum Duration: 20 sessions per year.

ii. Medication, such as nonsteroidal anti-inflammatory and analgesics would be indicated. Narcotics are not normally indicated.

iii. Biceps tendon sheath or subacromial steroid injections may be therapeutic. 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. Caution should be used in patients with a clinical suspicion of a partial tear. Injections should be minimized for patients under 30 years of age.

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

- Time to Produce Effect: One injection should provide demonstratable functional benefit.
- Maximum Duration: 3 injections per year at the same site when functional benefits are demonstrated with each injection.

iv. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12. Return to Work. By 8 to 11 weeks, with restoration of full-motion, return to full-duty should be anticipated.

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

E.3.f Surgical Indications

i. Acute Distal Biceps Tendon Rupture: normally requires urgent surgical repair.

ii. Acute Proximal Long Head Biceps Tendon Rupture: active patient participation in non-operative treatment is often successful; however, operative intervention may be indicated for young patients, manual laborers or others who require forceful supination regularly for their work.

iii. Bicipital Tendonitis: Conservative care prior to potential surgery must address flexibility and strength imbalances. Surgery may be considered when functional deficits interfere with activities of daily living and/or job duties after 12 weeks of active patient participation in non-operative therapy.

iv. Subluxing Bicipital Tendon: Most patients with this condition also have a subscapularis tear. Surgical stabilization of the bicipital tendon is not commonly indicated. Good outcome may be achieved through successful rehabilitation procedures. Surgery may be considered when functional deficits interfere with activities of daily living and/or job duties after 12 weeks of active patient participation in non-operative therapy.

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 and home exercise requirements. The patient should understand the length of partial and full disability expected post-operatively.

E.3.g Operative Procedures

1. Distal Biceps tendon repair.

2. Repair of rotator cuff pulley lesion.

3. Proximal tenodesis or tenotomy: Impingement of the biceps tendon can cause continued irritation, and pain preventing shoulder elevation. Tenodesis or tenotomy has been used for decreased elevation after therapy in conjunction with a sub scapular repair or irreparable rotator cuff tear.

E.3.h Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F. Therapeutic Procedures, Non-operative. Therapy may include the following:

It is reasonable to restrict ROM for 2 months for tenodesis or distal biceps tendon repair. Early loading of the tendon should be avoided. Surgical patients may not recover sufficiently to perform full activity for 3 to 12 months. Rehabilitation, lasting at least 6 to 12 weeks, is necessary to facilitate Maximum Medical Improvement (MMI).

- Frequency: 3 to 5 times per week for the first 2 weeks, 3 times per week for the following 2 weeks, then 1 to 2 times per week.

- Optimum Duration: 6 to 8 weeks with progression to home exercise and/or pool therapy.

- Maximum Duration: 12 weeks. Occasional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

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

E.4 Brachial Plexus and Shoulder Peripheral Nerve Injuries

Injuries to the brachial plexus and nerves of the shoulder girdle region may result in loss of motor and sensory function, pain, and instability of the shoulder. Signs and symptoms vary with the degree and mechanism of injury. The two modes of injury are: 1) acute direct or indirect traumatic injuries to the shoulder region, and 2) repetitive motion or overuse. Transient compression, stretch or traction (neurapraxia) causes sensory and motor signs lasting days to

weeks. Damage to the axon (axonotmesis) without disruption of the nerve framework may cause similar symptoms. The recovery time is delayed and depends upon axon re-growth distally from the site of injury. Laceration or disruption of the entire nerve with complete loss of framework (neurotmesis) is the most severe form of nerve injury and will invariably require surgical intervention. Return of function is dependent upon re-growth of the nerve distal to the injury site. Full return of motor function is variable and may take up to 18 months or longer.

Electromyography (EMG) is the most commonly used diagnostic modality to analyze nerve injuries. Electrophysiologic studies, such as electromyography and nerve conduction studies are generally accepted, well-established and widely used for localizing the source of neurological symptoms. These studies should be utilized as an extension of the history and clinical examination and to assess or monitor nerve recovery. Studies should be performed 3 to 4 weeks following injury or description of symptoms. Studies performed early may be falsely negative and usually require repeat testing 3 to 4 weeks after the original injury. Thus, early testing is not generally recommended. If the symptoms have been present for longer than 3 to 4 weeks, studies may be performed immediately after the initial evaluation. Serial studies may be indicated if initial studies are negative and may also be useful for gauging prognosis. Limb temperature should be controlled at 30 to 40 degrees centigrade.

A description of six common nerve injuries to the shoulder girdle and their treatment follow.

E4.a. Brachial Plexus Injuries

E.4.a.i Description/Definition

The Brachial Plexus is formed by the nerve roots of C5-C8 and T1. These nerve roots exit the cervical spine and pass through the scalene musculature. After leaving the scalene musculature, at the level of the clavicle, they form trunks, Department and chords which ultimately form the peripheral nerves of the arm.

E.4.a.ii Occupational Relationship

Direct injury to brachial plexus results in widespread sensory and motor loss. Direct trauma, subluxation to shoulder, clavicular fractures, shoulder depression, or head deviation away from the arm may result in variable brachial plexus lesions. Weight-lifting and carrying heavy back packs have also been associated with plexus injuries. Most injuries involve the upper and/or lower trunks. Upper trunk plexopathies may accompany full-thickness rotator cuff tears. Isolated middle trunk involvement is rare.

Infraclavicular brachial plexus injuries have been reported due to hematoma formation secondary to an axillary block. If this occurs, emergency evacuation of the hematoma may be indicated. Symptoms may appear hours-to-days after the procedure. Severe motor and sensory axonal loss is frequently seen on electrodiagnostic studies.

It is important to differentiate injuries to the brachial plexus from the acquired (non work-related) Parsonage-Turner Syndrome or neuralgic amyotrophy occurring without a history of trauma. This idiopathic syndrome begins with severe pain in the shoulder girdle and is

accompanied by resistance to passive motion. As the pain decreases, severe, near total weakness of one or more shoulder girdle muscles occurs. Almost total recovery can be expected but occurs over 2 to 3 years.

E.4.a.iii Specific Physical Exam Findings

Specific Physical Exam Findings may include

- Evidence of trauma or deformity;
- Identification of sensory loss and demonstration of weakness which relates to the severity and anatomy of the injury to the brachial plexus; and/or
- Pain with recreation of the motions related to the mechanism of injury.

E.4.a.iv Diagnostic Testing Procedures

A) EMG may show acute or chronic denervation of specific nerves. Nerve Conduction Studies demonstrating a loss of amplitude of 50% compared to the normal side are considered abnormal. NCVs/EMGs will be repeated at appropriate intervals to assess reinnervation.

B) If studies do not localize and give sufficient information, then additional information may be obtained from MRI and/or myelography. These studies are employed to differentiate root avulsion from severe brachial plexus injuries. Occasionally MRI may reveal the presence of an unexpected mass lesion consistent with a tumor.

E.4.a.v Non-operative Treatment Procedures

A) In closed injuries, observation is favored. Repeat electrophysiologic studies may be helpful to assess or monitor recovery.

B) Rehabilitation is based on procedures set forth in Section F, Non-operative Treatment Procedures. However, utilization of ultrasound, and cold and heat should be discussed with the primary care physician, since these modalities may aggravate nerve injury.

C) Medications such as analgesics, nonsteroidal anti-inflammatories, anti-depressants and anti-convulsants are indicated and narcotics may be indicated acutely. All medications should be prescribed as found in Section F.6 or Section F.4 in Thoracic Outlet Syndrome Guidelines.

D) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

E.4.a.vi Surgical Indications

In open injuries, acute exploration may be indicated if nerve discontinuity is visualized. Surgery may be considered post-injury when functional deficits interfere with activities of daily living and/or job duties after active participation in non-operative therapy.

In closed injuries, if functional deficits continue to be documented after 3 to 4 months of active patient participation in non-operative therapy, then exploration may be warranted and a surgical consultation should be considered. Patients with progressive weakness or a loss of function post-injury should be referred for surgical consultation immediately.

E.4.a.vii Operative Procedures

Exploration and repair.

E.4.a.viii Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist. Treatment may include the following:

Early therapeutic rehabilitation interventions are recommended to maintain range-of-motion (ROM) and progressive strengthening.

- Frequency: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks. 3 times per week for the following 2 weeks, then 1 to 2 times per week. The exact frequency per week will depend on the severity and level of the nerve injury.
- Optimum Duration: 6 to 8 weeks with progression to home exercise and/or pool therapy.
- Maximum Duration: Up to 24 sessions. Additional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

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

E4.b. Axillary Nerve

E.4.b.i Description/Definition

This nerve is derived from the 5th and 6th cervical roots and passes around the shoulder, supplying motor branches to the teres minor and the three heads of the deltoid. The axillary nerve provides sensation to the top of the shoulder at the level of the deltoid.

E.4.b.ii Occupational Relationship

Direct injury and penetrating wounds to the shoulder and upward pressure on the axilla can cause injury to the axillary nerve. Blunt trauma to the anterolateral shoulder has also been reported. Abnormalities of the nerve can be seen with fractures of the surgical neck of the humerus and dislocation of the shoulder. Axillary nerve injury may also occur from shoulder surgery. Patients complain of reduced abduction of overhead strength and/or numbness in the

lateral arm.

The quadrilateral space syndrome may cause pain in the axillary nerve region with abduction, external rotation, and extension. The axillary nerve and the posterior circumflex artery are in the space bound by the long head of the triceps, the teres minor, subscapularis, and latissimus dorsi when the arm is abducted. This syndrome is most commonly reported in young males 20 to 40 years of age and has been associated with overhead sports.

E.4.b.iii Specific Physical Exam Findings

Specific Physical Exam Findings may include:

- Weakness and atrophy of the deltoid muscle and teres minor;
- Strength is lost in abduction, flexion and extension of the shoulder; and/or
- Sensory loss is reported over the upper arm.

E.4.b.iv Diagnostic Testing Procedures

A) Plain x-rays.

B) EMG and Nerve Conduction Studies three weeks after the injury and repeated at appropriate intervals to assess for reinnervation. Comparison of EMG and NCV findings with the opposite side is usually necessary to diagnose the degree of injury.

C) MRI may be done to rule out other pathology.

D) To confirm quadrilateral space syndrome, an MRI angiogram may be done to visualize the posterior circumflex artery occlusion in abduction. However, occlusion is present in 80% of normals also. This study should only be done after conservative therapy and if surgery is being contemplated.

E.4.b.v Non-operative Treatment Procedures

A) Rehabilitation is based on procedures set forth in Section F, Non-operative Treatment Procedures. However, utilization of ultrasound, and cold and heat should be discussed with the primary care physician since these modalities may aggravate the nerve injury. Shoulder range-of-motion should be emphasized. For quadrilateral space syndrome, stretching of the posterior shoulder and teres minor is recommended.

B) Medications such as analgesics, nonsteroidal anti-inflammatory, anti-depressants and anti-convulsants are indicated. Narcotics may be indicated acutely. All medications should be prescribed as described in Section F.6, or Section F.4 in Thoracic Outlet Syndrome Guidelines.

C) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

E.4.b.vi Surgical Indications

Surgical procedures are usually not necessary, since most injuries to the axillary nerve are due to stretch and/or traction and recover within 3 to 6 months. Even when deltoid weakness persists, return to full activity can be expected. One may consider surgery when functional deficits interfere with activities of daily living and/or job duties after 3 to 4 months of active patient participation in non-operative therapy and with EMG/NCV documentation of ongoing denervation and loss of function. Lesions secondary to direct penetrating trauma or previous surgery may require more immediate intervention.

Surgery for quadrilateral space syndrome is not usually necessary as at least 70% of patients recover with conservative treatment. Indications may include 6 months of conservative treatment with persisting functional deficits, a positive arteriogram, and point tenderness at the posterior quadrilateral space. Overall outcomes of surgery cannot be predicted, as only a small case series have been reported.

E.4.b.vii Operative Procedures

Exploration and Repair

E.4.b.viii Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist. Treatment may include the following:

Early therapeutic rehabilitation interventions are recommended to maintain range-of-motion (ROM) and progressive strengthening.

- Frequency: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks. 3 times per week for the following 2 weeks, then 1 to 2 times per week. The exact frequency per week will depend on the severity and level of the nerve injury. Optimum Duration: 6 to 8 weeks with progression to home exercise and/or pool therapy.

- Maximum Duration: Up to 24 sessions. Additional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

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

E4.c. Long Thoracic Nerve

E.4.c.i Description/Definition

The long thoracic nerve is formed by the cervical fifth, sixth, and seventh roots; it crosses the border of the first rib and descends along the posterior surface of the thoracic wall to the serratus anterior.

E.4.c.ii Occupational Relationship

Injury can occur by direct trauma to the posterior triangle of the neck or trauma may be the result of chronically repeated or forceful shoulder depression. Repeated forward, overhead motion of the arms with the head tilted or rotated to the unaffected side, as well as, stretch or compression of the nerve with the arms abducted, can lead to long thoracic nerve dysfunction. Occasionally, severe traction with the shoulder compressed and the head tilted may be associated with long thoracic nerve pathology.

E.4.c.iii Specific Physical Exam Findings

Specific Physical Exam Findings may include:

- Dull ache in the region of the shoulder exacerbated by tilting the head away from the effected side and without sensory loss;
- Scapular deformity and/or winging may be described by patient or family; and/or
- Serratus anterior wasting; and
- Scapular winging at the inferior border that may be demonstrated by asking the patient to forward elevate and lean on his arms, such as against a wall and/or the examiner resisting protraction. (Spinal accessory nerve pathology also causes winging when the patient is abducting.)

E.4.c.iv Diagnostic Testing Procedures

A) Plain x-rays.

B) EMG and Nerve Conduction Studies three weeks after the injury and repeated at appropriate intervals to assess for reinnervation. Comparison of EMG and NCV findings with the opposite side is usually necessary to diagnose the degree of injury. Studies may also exclude more widespread brachial involvement.

C) MRIs or CTs if there is a need to rule out other pathology.

E.4.c.v Non-operative Treatment Procedures

A) Rehabilitation is based on procedures set forth in Section F, Non-operative Treatment Procedures. Utilization of ultrasound, cold, and heat should be discussed with the Primary Care Physician since these modalities can aggravate nerve injury. Strengthening of the scapular stabilizers should be stressed.

B) Orthotics may be used to stabilize the scapula but long-term benefit is not established.

C) Medications such as analgesics, nonsteroidal anti-inflammatory, anti-depressants and anti-convulsants are indicated and narcotics may be indicated acutely. All medications should be prescribed as seen in Section F.6, or Section F.4 in Thoracic Outlet Syndrome Guidelines.

D) Return to work with appropriate restrictions should be considered early in the course of treatment (Refer to Section F. 12, Return to Work). Heavy lifting and other activities that might stress the nerve should be avoided.

E.4.c.vi Surgical Indications

Laceration of the nerve and progressive loss of function are indications for prompt surgical intervention.

Surgery may be considered when functional deficits interfere with activities of daily living and/or job duties after 4 to 6 months of active participation in non-operative therapy. Surgical consultation should occur at 3 to 4 months post-injury for these patients. In most cases, function will recover with conservative therapy in 6 to 12 months.

E.4.c.vii Operative Procedures

Exploration and Repair.

- Muscle transfer.
- Scapular fixation.

E.4.c.viii Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist. Treatment may include the following:

Early therapeutic rehabilitation interventions are recommended to maintain ROM with progressive strengthening focusing on the scapular stabilizers.

- Frequency: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks. 3 times per week for the following 2 weeks, then 1 to 2 times per week. The exact frequency per week will depend on the severity and level of the nerve injury.
- Optimum Duration: 6 to 8 weeks with progression to home exercise and/or pool therapy.
- Maximum Duration: Up to 24 sessions. Additional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

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

E4.d. Musculocutaneous Nerve

E.4.d.i Description/Definition

The nerve is derived from the fifth and sixth cervical roots. It innervates the coracobrachialis, biceps and brachioradialis muscles and also provides sensation to the lateral aspect of the forearm.

E.4.d.ii Occupational Relationship

Trauma (including surgery) or penetrating wound to the brachial plexus, coracobrachialis, and shoulder often can cause nerve injury.

Most commonly, a stretch/traction injury with the arm in abduction and external rotation induces nerve dysfunction. Cases have been reported to be associated with backpack use, pitching, heavy weight-lifting, mal-position during sleep or surgery, and sudden, forceful extension of the elbow. Complaints may include pain from the axilla into the forearm, biceps weakness, or sensation changes to the lateral forearm from the lateral antebrachial cutaneous nerve.

E.4.d.iii Specific Physical Exam Findings

Specific Physical Exam Findings may include:

- Weakness and atrophy in the biceps and brachialis; and/or
- Sensory loss over the lateral aspect of the forearm; however, this is not always seen.

E.4.d.iv Diagnostic Testing Procedures

EMG and Nerve Conduction Studies three weeks after the injury and repeated at appropriate intervals to assess for reinnervation. Comparison of EMG and NCV findings with the opposite side is usually necessary to diagnose the degree of injury.

E.4.d.v Non-operative Treatment Procedures

A) Rehabilitation is based on procedures set forth in Section F, Non-operative Treatment Procedures. Utilization of ultrasound, cold and heat should be discussed with the primary care physician, since these modalities can aggravate nerve injury.

B) Medications such as analgesics, nonsteroidal anti-inflammatory, anti-depressants and anti-convulsants are indicated and narcotics may be indicated acutely. All medications should be prescribed as seen in Section F.6, or Section F.4 in Thoracic Outlet Syndrome Guidelines.

C) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

E.4.d.vi Surgical Indications

Laceration of the nerve and progressive loss of function are indications for prompt surgical intervention.

Surgery may be considered when functional deficits interfere with activities of daily living and/or job duties after 4 to 6 months of active patient participation in non-operative therapy. Surgical consultation should occur at 3 to 4 months post-injury for these patients. In most cases, function will recover with conservative therapy in 6 to 12 months.

E.4.d.vii Operative Procedures

Exploration and Repair

E.4.d.viii Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist. Treatment may include the following:

Early therapeutic rehabilitation interventions are recommended to maintain ROM with progressive strengthening.

- Frequency: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks. 3 times per week for the following 2 weeks, then 1 to 2 times per week. The exact frequency per week will depend on the severity and level of the nerve injury.
- Optimum Duration: 6 to 8 weeks with progression to home exercise and/or pool therapy.
- Maximum Duration: Up to 24 sessions. Additional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

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

E4.e. Spinal Accessory Nerve

E.4.e.i Description/Definition

Spinal Accessory Nerve is the eleventh cranial nerve innervating the ipsilateral sternocleidomastoid and trapezius muscles which are extremely important for scapular control and ultimately shoulder function.

E.4.e.ii Occupational Relationship

Direct trauma to the posterior neck, forceful compression of the shoulder downward, and/or deviation of the head away from the traumatized shoulder can lead to injury to this nerve such as from a fall or motor vehicle accident. Surgical resection of the posterior neck can disrupt the nerve. Patients complain of inability to fully elevate or abduct above horizontal.

E.4.e.iii Specific Physical Exam Findings

Specific Physical Exam Findings may include:

- Pain in the shoulder;
- Asymmetrical neckline;
- Scapular winging with the arms out to the side, abduction, or with external rotation;
- Weakness or paralysis of the trapezius with weakness in forward flexion or abduction above 90 degrees; and/or
- Drooping of the shoulder.

E.4.e.iv Diagnostic Testing Procedures

A) EMG and Nerve Conduction Studies three weeks after the injury and repeated at appropriate intervals to assess for reinnervation. Comparison of EMG and NCV findings with the opposite side is usually necessary to diagnose the degree of injury.

B) Radiographic procedures may be necessary to exclude lesions at the base of the brain or upper cervical spine.

E.4.e.v Non-operative Treatment Procedures

A) Rehabilitation is based on procedures set forth in Section F, Non-operative Treatment Procedures. Utilization of ultrasound, cold and heat should be discussed with the Primary Care Physician, since these modalities can aggravate nerve injury. Resistance exercises to strengthen muscles. Braces may be used but probably have no long-term value.

B) Occupational work station will usually need significant modification due to inability to work above 90 degrees flexion or abduction. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

C) Medications such as analgesics, nonsteroidal anti-inflammatory, anti-depressants and anti-convulsants are indicated and narcotics may be indicated acutely. All medications should be prescribed as seen in Section F.6, or Section F.4 in Thoracic Outlet Syndrome Guidelines.

E.4.e.vi Surgical Indications

Laceration of the nerve and progressive loss of function are indications for prompt surgical intervention.

Surgery may be considered when functional deficits interfere with activities of daily living and/or job duties after 4 to 6 months of active participation in non-operative therapy. Surgical consultation should occur at 3 to 4 months post-injury for these patients. In most cases, function will recover with conservative therapy in 6 to 12 months.

E.4.e.vii Operative Procedures

- Exploration and repair.
- Tendon transfer – Trapezius, levator scapular, rhomboids.
- Scapular fixation for cases with heavy work demands and failed previous procedures.

E.4.e.viii Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist. Treatment may include the following:

Early therapeutic rehabilitation interventions are recommended to maintain ROM with progressive strengthening focusing on scapula stabilizers.

- Frequency: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks. 3 times per week for the following 2 weeks, then 1 to 2 times per week. The exact frequency per week will depend on the severity and level of the nerve injury.
- Optimum Duration: 6 to 8 weeks with progression to home exercise and/or pool therapy.
- Maximum Duration: Up to 24 sessions. Additional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

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

E4.f. Suprascapular Nerve

E.4.f.i Description/Definition

This nerve is derived from the fifth and sixth cervical root, superior trunk of the brachial plexus and it innervates the supraspinatus and infraspinatus muscles of the rotator cuff.

E.4.f.ii Occupational Relationship

Supraclavicular trauma, stretch, and friction through the suprascapular notch or against the transverse ligament at the notch, or a fall on an outstretched arms can cause injury to the nerve.

Repetitive use of the arm has been shown on occasion to cause traction to the nerve. Damage, may occur secondary to a ganglion cyst which usually causes infraspinatus atrophy. Ganglion cysts may be associated with labral pathology and/or rotator cuff tears. These are most commonly reported in athletes. Up to 1/3 of volley ball players in one study had asymptomatic infraspinatus atrophy secondary to nerve damage. Nerve damage may also occur associated with a full rotator cuff tear. Since the clinical findings are similar for both diagnoses, clinicians should always consider the possibility of nerve damage when atrophy accompanies a rotator cuff tear.

E.4.f.iii Specific Physical Exam Findings

Specific Physical Exam Findings may include:

- Pain at the shoulder;
- Wasting at the supraspinatus and/or infraspinatus muscles with weakness of external rotation and abduction with overhead activity; and/or
- A positive Tinel's eliciting a provocative pain response.

E.4.f.iv Diagnostic Testing Procedures

A) EMG and Nerve Conduction Studies three weeks after the injury and repeated at appropriate intervals to assess for reinnervation. Comparison of EMG and NCV findings with the opposite side is usually necessary to diagnose the degree of injury.

B) If one suspects a mass lesion at the suprascapular notch or related labral or cuff pathology then an MRI or sonography may be indicated.

C) CT scan with attention to the suprascapular notch may be used to evaluate for boney impingement.

E.4.f.v Non-operative Treatment Procedures

A) Resolution of symptoms usually occurs within 6 to 12 months of diagnosis with non-operative treatment in the absence of lesions such as a cyst.

B) Rehabilitation is based on procedures set forth in Section F, Non-operative Treatment Procedures. An emphasis should be placed on posture; maintaining full shoulder motion; strengthening; and stretching the posterior capsule. Utilization of ultrasound, cold and heat should be discussed with the primary care physician, since these modalities can aggravate nerve injury.

C) Medications such as analgesics, nonsteroidal anti-inflammatory, anti-depressants, and anti-convulsants are indicated and narcotics may be indicated acutely. All medications should be prescribed as seen in Section F.6, or Section F.4 in Thoracic Outlet Syndrome Guidelines.

D) Return to work with appropriate restrictions should be considered early in the course of

treatment (Refer to Section F. 12, Return to Work). Heavy lifting or activities that aggravate the condition should be avoided.

E.4.f.vi Surgical Indications

Surgical release is warranted depending upon the presence of a ganglion cyst, results of the electrophysiologic studies, and/or absence of improvement with conservative management.

In cases without cysts or other operative diagnoses, non-operative treatment may be tried for 3 to 6 months due to the observed recovery rate of cases with no treatment. Difficulty performing functional activities after active patient participation should be the deciding factor. [General Principles]

E.4.f.vii Operative Treatment Procedures

A) Decompression and/or excision of ganglion cyst; and/or labral repair.

B) Surgical release at the suprascapular notch or spinoglenoid region.

E.4.f.viii Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F, Therapeutic Procedures, Non-operative. Treatment may include the following:

Early therapeutic rehabilitation interventions are recommended to maintain ROM with progressive strengthening.

- Frequency: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks. 3 times per week for the following 2 weeks, then 1 to 2 times per week. The exact frequency per week will depend on the severity and level of the nerve injury.
- Optimum Duration: 6 to 8 weeks with progression to home exercise and/or pool therapy.
- Maximum Duration: Up to 24 sessions. Additional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

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

E5. Bursitis/Rotator Cuff Tendonopathy of the Shoulder

E.5.a Description/Definition

Bursitis: Acute or chronic inflammation of the bursa (a potential fluid filled sac) that may be caused by trauma, chronic overuse, inflammatory arthritis, and acute or chronic infection, and

generally presents with localized pain and tenderness of the shoulder.

Tendonopathy: includes the terms tendonitis, an inflammation of the tendon and tendonosis, non-inflammatory degenerative processes.

Rotator cuff tendonopathy may involve one or more of the four musculotendonous structures arising from the scapula and inserting on the lesser or greater tuberosity of the humerus may be involved.

These structures include one internal rotator (subscapularis), and two external rotators (infraspinatus and teres minor), and the supraspinatus which assists in abduction.
History may include: nocturnal pain, pain with over-the-shoulder activities, feeling of shoulder weakness and specific limitations of movement. Prior treatment for presenting complaint(s) and pertinent familial history should be obtained.

E.5.b Occupational Relationship

Onset of symptoms, date, mechanism of onset, and occupational history and current job requirements should be correlated with the intensity, character, duration and frequency of associated pain and discomfort. Tendonopathy may include symptoms of pain and/or achiness that occur after blunt trauma or repetitive use of the shoulder. Bursitis is often a sequela of an occupational strain or tendonopathy in the absence of other mitigating factors.

E.5.c Specific Physical Exam Findings

Specific Physical Exam Findings may include:

1. Palpation elicits localized tenderness over the particular bursa or inflamed tendon with loss of motion during activity;

2. Painful arc may be seen between 40 and 120 degrees; and/or

3. Bursitis may be associated with other shoulder injury diagnoses such as impingement, rotator cuff instability, tendonitis, etc.; refer to applicable diagnosis subsections for additional guidelines.

E.5.d Diagnostic Testing Procedures

Plain x-rays include:
A) AP view. Elevation of the humeral head indicates rotator cuff tear;
B) Lateral view in the plane of the scapula or an axillary view determines if there is anterior or posterior dislocation, or the presence of a defect in the humeral head (a Hill-Sachs lesion);
C) Axillary view is also useful to demonstrate arthritis and spurs on the anterior inferior acromion;
D) Outlet view determines if there is a downwardly tipped acromion.

Lab Tests:

Laboratory tests may be used to rule out systemic illness or disease when proper clinical presentation indicates the necessity for such testing. Testing may include sedimentation rate, rheumatoid profile, complete blood count (CBC) with differential, and serum uric acid level. Routine screening for other medical disorders may be necessary, as well as, bursal aspiration with fluid analysis.

The **subacromial injection** has generally been considered the gold standard for differentiating ROM loss from impingement versus rotator cuff tears. Alleviation from pain may help to confirm the diagnosis. Patients with impingement should recover normal strength after the injection, while those with rotator cuff tears usually do not recover normal strength. However, manually tested elevation strength perceived as normal does not always rule out rotator cuff tear and this may contribute to incorrect diagnoses with this technique. There is good evidence that blinded subacromial blocks are not accurate. Up to a third of blinded injections may involve the cuff, and are likely to cause pain. This may lead to an incorrect diagnosis. One study demonstrated that at least half of the positive responders did so up to 40 minutes after the injection; therefore, a negative response should not be diagnosed until 40 minutes post injection. The inaccuracy of the injection and patient response in some cases may contribute to its inability to completely predict the amount of recovery from subacromial decompression.

If there is a concern regarding needle placement, sonography or fluoroscopy may be used.

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

E.5.e Non-operative Treatment Procedures

i. Therapeutic interventions are the mainstay of treatment. They should include ROM, active therapies, 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 instruction in a home exercise program targeted to further improve ROM and strength of shoulder girdle musculature. Refer to Section F. Therapeutic Procedures, Non-operative.

ii. May return to work without overhead activities and lifting with involved arm. An evaluation of the occupational work being performed and the work station may be necessary to institute ergonomic changes or accommodations. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

iii. Medications such as oral nonsteroidal anti-inflammatory, oral steroids and analgesics.

iv. Steroid injections may be therapeutic. 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: 3 injections at the same site per year when functional benefits are demonstrated with each injection.

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

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

E.5.f Operative Procedures

Are not commonly indicated for bursitis or tendonopathy. Refer to other related diagnoses in Section E, Specific Diagnosis Testing and Treatment Procedures.

E6. Calcifying Tendonitis

E.6.a Description/Definition

Calcifying tendonitis is characterized by the deposition of hydroxyapatite (calcium phosphate) in any tendon of the rotator cuff. The supraspinatus tendon is affected most frequently. It is a morphologic diagnosis which may be asymptomatic or may produce pain. It may be present in a painful shoulder without being the cause of the pain. Radiographically evident calcifications are present without producing symptoms in some adults (7.5% to 20%). The calcifying process occurs in two phases: the formative phase, in which calcium deposits coalesce in the tendon matrix, and the resorptive phase, in which the calcium deposits are removed by phagocytic cells. The resorptive phase is thought to be the painful phase of the disorder. The etiology is not known, but trauma is considered unlikely to be causative. Pain may be accompanied by loss of ROM, a painful arc of motion, or by impingement signs.

Morphologic classification of calcium deposits is based on the homogeneity and borders of the deposit on plain x-ray. (Gartner and Simons Classifications) Type I is homogenous with well-defined borders. Type II is heterogeneous in structure with sharp outline or homogenous in structure with no defined border. Type III is cloudy and transparent with no well-defined border. Type III frequently resolves without treatment. Generally, they are not associated with rotator cuff tears. The size of the deposit has not been shown to be correlated with severity of symptoms.

E.6.b Occupational Relationship

Symptomatic calcifying tendonitis may occur after repetitive loading of the shoulder with force, such as with shoveling, raking, pushing, pulling, lifting at/or above shoulder level, or after blunt trauma to the shoulder.

E.6.c Specific Physical Exam Findings

Specific Physical Exam Findings may include:

- Pain with palpation to the shoulder with active or passive abduction and external rotation of the shoulder (painful arc);
- Pain with specific activation of the involved muscles; and/or
- Pain with impingement signs;
- Severe pain on examination in some cases.

E.6.d Diagnostic Testing Procedures

Plain x-ray films including AP lateral, axial, 30 degrees caudally angulated AP, Outlet view.

If shoulder pain is refractory to 4 to 6 weeks of non-operative care and other diagnoses are suspected, adjunctive testing, such as MRI, sonography or arthrography, may be indicated.

E.6.e Non-operative Treatment Procedures

i. Therapeutic rehabilitation interventions are the mainstay of treatment. They should include ROM, active therapies, and a home exercise program. Passive as well as active therapies may be used for pain control, including iontophoresis. Therapy should progress to strengthening and instruction in a home exercise programs targeted to ongoing ROM and strengthening of shoulder girdle musculature. Refer to section F. Therapeutic Procedures, Non-operative for other therapies as well as a description of active and passive therapies.

ii. Medications such as oral nonsteroidal anti-inflammatories, analgesics, and narcotics for significant pain. Refer to Section F.6 Medications.

iii. May return to work without overhead activities and lifting with involved arm. An evaluation of the occupational work station may be necessary to institute ergonomic changes or accommodations. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

iv. Therapeutic ultrasound (Refer to Passive Therapy, Section F.14.) Ultrasound may be used for tendonitis. There is some evidence that ultrasound alleviates symptoms, improves function, and reduces calcium deposits better than sham ultrasound in the short term. The advantage of ultrasound beyond 6 weeks is not certain.

v. Ultrasound-guided needle lavage and aspiration requires a physician skilled in sonographic techniques and is still considered investigational due to lack of randomized controlled trials. It is less costly and reportedly less painful than extracorporeal shock wave therapy. It requires prior authorization but may be an appropriate therapy in select patients who fail other conservative treatment.

vi. Extracorporeal shock wave therapy has good evidence for improving pain and function with calcifying tendonitis Type I or II when conservative treatment has not resulted in adequate

functional improvement (See ESWT). General anesthesia or conscious sedation is not required for this procedure. Patients should be cautioned regarding the potential of avascular necrosis.

vii. Steroid injections may be therapeutic. Injections under significant pressure should be avoided as the needle may be penetrating the tendon and injection into the tendon can cause tendon degeneration, tendon breakdown, or rupture. Injections should be minimized for patients under 30 years of age.

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

- Time to Produce Effect: One injection.
- Maximum: 3 injections at the same site per year when functional benefits are demonstrated with each injection.

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

E.6.f Surgical Indications

When functional deficits interfere with activities of daily living and/or job duties after 3 to 4 months of active patient participation in non-operative therapy. The natural history of calcifications includes resorption over time, with or without therapy.

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. The patient should agree to comply with the pre- and post-operative treatment plan and home exercise requirements. The patient should understand the length of partial and full disability expected post-operatively.

E.6.g Operative Procedures

Either an arthroscopic or open procedure may be used. Careful lavage to remove all calcium deposits from the surgical field is important. Full recovery may vary from 3 to 6 months.

E.6.h Post-operative Treatment

Individualized rehabilitation programs are based upon communication between the surgeon and the therapist using the treatments found in Section F, Therapeutic Procedures, Non-operative. Treatment may include the following:

i. Sling, pillow sling, or abduction splint;

ii. Gentle pendulum exercise, passive glenohumeral range-of-motion and posterior scapular stabilizing training can be instituted;

iii. Patients can judiciously return to activities as tolerated per physician recommendations. If there is a significant tendon repair, progression will be delayed;

iv. Progressive resistive exercise program beginning at 2 months with gradual returning to full activity at 4 to 6 months; all active non-operative procedures listed in Section F, Non-operative Treatment Procedures should be considered.

- Frequency: 3 to 5 times per week for the first 2 weeks, 3 times per week for the following 2 weeks, then 1 to 2 times per week.
- Optimum Duration: 6 to 8 weeks with progression to home exercise and/or pool therapy.
- Maximum Duration: 12 weeks. Occasional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

v. Return to work and restrictions after surgery may be made by an experienced primary occupational medicine physician in consultation with the surgeon or by the surgeon. Depending upon the patient's functional response and their job requirements, return to work with job modifications may be considered as early as one week post-operatively. The employer must be able to fully accommodate restrictions of overhead activities or heavy lifting. Physician/surgeon should be very specific regarding restrictions for overhead activities and heavy lifting.

Work restrictions should be evaluated every 4 to 6 weeks during post-operative recovery and rehabilitation, with appropriate written communications to both the patient and the employer. Should progress plateau, the provider should re-evaluate the patient's condition and make appropriate adjustments to the treatment plan.

E7. Fractures

There are five common types of shoulder fractures; each type will be addressed separately and in the order of most frequent occurrence.

E7.a. Clavicular Fracture

E.7.a.i Occupational Relationship

Can result from direct blows or axial loads applied to the upper limb; commonly associated injuries include rib fractures, long-bone fractures of the ipsilateral limb and scapulothoracic dislocations.

E.7.a.ii Specific Physical Exam Findings

Specific Physical Exam Findings may include:

- Pain along the clavicle;
- Abrasions on the chest wall, clavicle and shoulder;
- Deformities in the above regions; and/or
- Pain with palpation and motion at the shoulder joint area.

E.7.a.iii Diagnostic Testing Procedures

Clavicle x-rays. If they do not reveal sufficient information, then a 20 degree caudal-cranial AP view centered over both clavicles can be done.

E.7.a.iv Non-operative Treatment Procedures

A) Most are adequately managed by closed techniques and do not require surgery. After reduction, the arm is immobilized in a sling or figure-8 bandage. Shoulder rehabilitation is begun with pendulum exercises 10 to 14 days after injury. Subsequently, with pain control, the therapy program can be progressed with therapeutic approaches as indicated in Section F, Non-operative Treatment Procedures.

B) Medication, such as analgesics and nonsteroidal anti-inflammatories, would be indicated; narcotics may be indicated acutely for fractures and should be prescribed as indicated in Section F.6, Medications.

C) All patients with fractures, 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.

All female patients over 65 should be referred for an osteoporosis evaluation. 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 that 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 factures 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.

D) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and provided with appropriate counseling.

E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

E.7.a.v Surgical Indications

Open fractures, vascular or neural injuries requiring repair, bilateral fractures, ipsilateral scapular or glenoid neck fractures, scapulothoracic dislocations, flail chest and non-union (displaced-closed fractures that show no evidence of union after 4 to 6 months). A Type II fracture/dislocation at the AC joint where the distal clavicular fragment remains with the acromion and the coracoid, and the large proximal fragment is displaced upwards is another indication for surgery.

Completely displaced midclavicular fractures may be an indication for surgical repair. There is some evidence that plate fixation of completely displaced fractures involving the middle third of the clavicle leads to slightly better shoulder function than immobilization without surgical fixation and shorter healing time. Conservatively treated completely displaced fractures heal with mild decreases in strength and good patient satisfaction in 70% or more of cases. However, initial surgical repair may be considered for patients who desire excellent shoulder function for sport or job activities and/or those with approximately 2 cm or greater shortening of the clavicle.

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.

E.7.a.vi Operative Procedures

Repair of fracture or associated distal clavicular resection using plates and screws or an intramedullary device.

E.7.a.vii Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist. This program would begin with 2 to 3 weeks of rest with a shoulder immobilizer while encouraging isometric deltoid strengthening. Pendulum exercises with progression to assisted forward flexion and external rotation would follow. Strengthening exercises should be started at 10 to 12 weeks as indicated in Section F, Non-operative Treatment Procedures.

E.7.a.viii Bone-Growth Stimulators

Electrical: Preclinical and experimental literature has shown a stimulatory effect of externally applied electrical fields on the proliferation and calcification of osteoblasts and periosteal cells. Ensuing clinical literature on electrical stimulation of bone fractures has principally focused on the spine and lower extremity. Several techniques have been developed to deliver an electrical stimulus to a fracture or osteotomy site.

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

High-quality literature of electrical bone growth stimulation are lacking for shoulder injuries. Literature is conflicting in the use of electrical stimulation in other regions of the body. Due to a lack of supporting scientific evidence, it requires prior authorization and may be only considered when conventional surgical management has failed.

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 certain fractures of bones outside the shoulder joint. Shoulder fractures were not included in this literature. 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. Prior authorization is required.

E7.b. Proximal Humeral Fractures

Fractures of the humeral head have been classically described using Neer criteria; however, literature has shown a low level of observer agreement. These fractures are commonly referred to as one, two, three or four part fractures based on the number of fracture fragments. Displaced fractures of the greater tuberosity and impacted angulated fractures of the humeral head also have specific associated problems.

E.7.b.i Occupational Relationship

May be caused by a fall onto an abducted arm; high-energy (velocity or crush) trauma with an abducted or non-abducted arm. Associated injuries are common, such as glenohumeral dislocation; stretch injuries to the axillary, musculocutaneous, and radial nerves; and axillary artery injuries with high-energy accident.

E.7.b.ii Specific Physical Exam Findings

Specific Physical Exam Findings may include:

- Pain in the upper arm;
- Swelling and bruising in the upper arm, shoulder and chest wall;
- Abrasions about the shoulder; and/or
- Pain with any attempted passive or active shoulder motion.

E.7.b.iii Diagnostic Testing Procedures

A) X-ray trauma series (3 views) are needed; AP view, axillary view and a lateral view in the plane of the scapula. The latter two views are needed to determine if there is a glenohumeral dislocation. When an axillary view cannot be obtained, a CT should be done to rule out posterior dislocation.

B) Vascular studies are obtained emergently if the radial and brachial pulses are absent.

C) Classification can be by the Neer Method, however, agreement between observers using this method is poor. There are four fragments: the humeral shaft, humeral head, greater tuberosity, and the lesser tuberosity. The fragments are not usually considered fragments unless they are separated by 1cm or are angulated 45 degrees or more.

E.7.b.iv Non-operative Treatment Procedures

A) Non-displaced and minimally displaced fractures are generally treated conservatively with broad arm sling or body swath. There is some evidence that simple non-displaced proximal humeral fractures recover normal function more quickly when physical therapy is started one week after the fracture than when it is started three weeks after the fracture. Immobilization without physical therapy for more than one week is not recommended.

B) Anterior or posterior dislocation associated with minimally displaced fractures can usually be reduced by closed means, but a general anesthetic is needed. These are usually not performed in the emergency room in order to avoid displacement of the fracture.

C) Medication, such as analgesics and nonsteroidal anti-inflammatories, would be indicated; narcotics may be indicated acutely for fracture and should be prescribed as indicated in Section F.6, Medications.

D) Immobilization may be provided with a sling, to support the elbow, or with an abduction immobilizer if a non-impacted greater tuberosity fragment is present. Immobilization is usually continued for 4 to 6 weeks; however, the time will vary according to the type of fracture and surgeon’s discretion.

E) Shoulder rehabilitation is begun with pendulum exercises 0 to 14 days after injury. Light, functional exercises may be added at 2 to 4 weeks post-injury. Subsequently, with pain control, the therapy program can be progressed with therapeutic approaches as described in Section F, Non-operative Treatment Procedures. Home exercises are essential for recovery.

- Time to Produce Effect: 6 sessions.
- Optimum Duration: 9 sessions.
- Maximum Duration: 12 to 24 sessions.

F) Use of the injured arm at work is determined by the healthcare provider or treating physician. The patient may, however, return to work without use of the injured arm soon after the injury.

Refer to Section F. 12, Return to Work.

G) Also refer to osteoporosis in this Section 7.a. iv. Clavicular Fracture.

H) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and provided with appropriate counseling.

E.7.b.v Surgical Indications

A) Greater tuberosity fractures with 5mm of displacement usually require surgical fixation. However, rehabilitation may start as early as 2 to 3 days post-operatively.

B) Two-part fractures are repaired according to the surgeon's preference. Internal fixation may be necessary to prevent varus or valgus angulation of the humerus; however, it is unclear whether this technique is more successful than more conservative treatment particularly in patients over 70. Percutaneous techniques and closed reduction have both been used.

C) Three and four-part fractures frequently require operative treatment. Internal fixation is commonly used. Hemiarthroplasty may be used in the elderly population or for severely comminuted fractures. Use of this technique in the younger active patients frequently leads to the need for revision surgery and/or increased wear of the glenoid cavity. For four-part fractures with a fractured greater tuberosity, reverse arthroplasties have also been described, however; they should rarely be used since the long-term success of this prosthesis is currently unknown. This procedure is described under Section G. Therapeutic Procedures, Operative Shoulder Replacement (arthroplasty).

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.

E.7.b.vi Operative Procedures

Percutaneous or internal fixation of the fracture or arthroplasty.

E.7.b.vii Post-operative Treatment

A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatment found in Section F.

B) Schanz pins will require removal, frequently between 2 to 6 weeks.

C) One-time Extracorporeal Shock Wave Therapy (ESWT) has been purported to increase healing in non-union fractures of long bones. None have been tested in prospective controlled studies. They are all considered experimental and are not recommended at this time.

D) Bone-Growth Stimulators. (Refer to this section 7a. Clavicular Fractures.)
E) Hyperbaric oxygen therapy – there is no evidence to support long-term benefit of hyperbaric oxygen therapy for non-union upper extremity fractures. It is not recommended.

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

E7.c. Humeral Shaft Fractures

E.7.c.i Occupational Relationship

A direct blow can fracture the humeral shaft at the junction of its middle and distal thirds. Twisting injuries to the arm will cause a spiral humeral shaft fracture. High energy (velocity or crush) will cause a comminuted humeral shaft fracture.

E.7.c.ii Specific Physical Exam Findings

Specific Physical Exam Findings may include:

- Deformity of the arm;
- Bruising and swelling; and/or
- Possible sensory and/or motor dysfunction of the radial nerve.

E.7.c.iii Diagnostic Testing Procedures

A) Plain x-rays including AP view and lateral of the entire humeral shaft.

B) Vascular studies if the radial pulse is absent.

C) Compartment pressure measurements if the surrounding muscles are swollen, tense and painful and particularly if the fracture resulted from a crush injury.

E.7.c.iv Non-operative Treatment Procedures

A) Most isolated humeral shaft fractures can be managed non-operatively.

B) Medication, such as analgesics and nonsteroidal anti-inflammatories, would be indicated. Narcotics may be indicated acutely for fracture and should be prescribed as indicated in Section F.6, Medications.

C) A coaptation splint may be used.

D) At 2 to 3 weeks after injury, a humeral fracture orthosis may be used to allow for full elbow motion.

E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

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

G) Refer to comments related to osteoporosis in this Section 7.a. iv, Clavicular Fracture.

H) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and provided with appropriate counseling.

E.7.c.v Surgical Indications

Indications for operative care would include:

- Open fracture;
- Associated forearm or elbow fracture (i.e., the floating elbow injury);
- Burned upper extremity;
- Associated paraplegia;
- Multiple injuries (polytrauma);
- A radial nerve palsy which presented after closed reduction;
- Pathologic fracture related to an occupational injury; and/or
- Inability to perform basic activities of daily living while following conservative care.

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.

E.7.c.vi Operative Procedures

A) Accepted methods of internal fixation of the fracture include:

- A broad plate and screws; and/or
- Intramedullary rodding with or without cross-locking screws may be used but is associated with increased shoulder pain;

B) Human Bone Morphogenetic Protein (RhBMP). Use of this material for surgical repair of shoulder fractures requires prior authorization. Refer to Section G. Operative Procedures, for further details.

E.7.c.vii Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F. Therapeutic Procedures, Non-operative. Treatment may include the following:

A) Following rigid internal fixation, therapy may be started to obtain passive and later active shoulder motion using appropriate therapeutic approaches as indicated in Section F, Non-operative Treatment Procedures. Active elbow and wrist motion may be started immediately.

Early therapeutic rehabilitation interventions are recommended to maintain range-of-motion (ROM) and progressive strengthening.

- Frequency: 3 to 5 times per week for the first 2 weeks, 3 times per week for the following 2 weeks, then to 2 times per week.
- Optimum Duration: 6 to 8 weeks with progression to home exercise and/or pool therapy.
- Maximum Duration: 12 weeks. Additional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains or if a nerve injury accompanies the fracture.

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

C) Bone Growth Stimulation. (Refer to Section 7a. Clavicular Fractures.)

E7.d. Scapular Fractures

E.7.d.i Occupational Relationship

These are the least common of the fractures about the shoulder and include acromial, glenoid, glenoid neck and scapular body fractures. With the exception of anterior glenoid lip fractures caused by an anterior shoulder dislocation, all other scapular fractures are due to a high-energy injury.

E.7.d.ii Specific Physical Findings

Specific Physical Findings may include:

- Pain about the shoulder and thorax;
- Bruising and abrasions;
- Possibility of associated humeral or rib fractures; and/or
- Vascular problems (pulse evaluation and Doppler examination).

E.7.d.iii Diagnostic Testing Procedures

- Trauma x-ray series - AP view, axillary view, and a lateral view in the plane of the scapula.
- Arteriography if a vascular injury is suspected.
- Electromyographic exam if nerve injuries are noted.

E.7.d.iv Non-operative Treatment

A) Non-displaced acromial, coracoid, glenoid, glenoid neck and scapular body fractures may all be treated with the use of a shoulder immobilizer.

B) Medication, such as analgesics and nonsteroidal anti-inflammatories, would be indicated. Narcotics may be indicated acutely for fracture and should be prescribed as indicated in Section F.6, Medications.

C) Pendulum exercises may be started within the first week.

D) Progress to assisted range-of-motion exercises at 3 to 4 weeks using appropriate therapeutic procedures as indicated in Section F, Non-operative Treatment Procedures.

E) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

F) Refer to comments related to osteoporosis in this Section 7.a. iv.-Clavicular Fracture.

G) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and provided with appropriate counseling.

E.7.d.v Surgical Indications

- Displaced acromial fractures.
- Displaced glenoid fractures.
- Displaced scapular body fractures in some circumstances.
- Displaced fractures of the scapular neck and the ipsilateral clavicle.

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.

E.7.d.vi Operative Treatment

A) Displaced acromial fractures are treated with internal fixation.

B) Displaced glenoid fractures greater than 5 mm should be fixed internally. Fractures with less displacement may be treated surgically according to the surgeon's discretion. Two and three dimensional CT scans may be useful in planning the surgical approach.

C) Displaced scapular body fractures require internal fixation if the lateral or medial borders are displaced to such a degree as to interfere with scapulothoracic motion.

D) Displaced fractures of the scapular neck and the ipsilateral clavicle require internal fixation of the clavicle to reduce the scapular neck fracture.

E.7.d.vii Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist using the appropriate therapeutic procedures as indicated in Section F, Non-operative Treatment Procedures. Treatment may include the following:

A) A shoulder immobilizer is utilized. Pendulum exercises initially begin at one week, and deltoid isometric exercises are started early at 4 to 6 weeks, active ROM is usually commenced.

B) Early therapeutic rehabilitation interventions are recommended to maintain ROM with progressive strengthening.

- Frequency: 3 to 5 times per week for the first 2 weeks, 3 times per week for the following 2 weeks, then 1 to 2 times per week.
- Optimum Duration: 8 to 10 weeks with progression to home exercise and/or pool therapy.
- Maximum Duration: 12 to 14 weeks. Occasional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

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

E7.e. Sternoclavicular Dislocation/Fracture

E.7.e.i Occupational Relationship

Sudden trauma to the shoulder/anterior chest wall. Anterior dislocations of the sternoclavicular joint usually do not require active treatment; however, symptomatic posterior dislocations will require reduction.

E.7.e.ii Specific Physical Findings

Specific Physical Findings may include:

- Dysphagia and shortness of breath which requires emergency reduction.
- Pain at the sternoclavicular area;
- Abrasions on the chest wall, clavicle and shoulder;
- Deformities in the above regions; and/or
- Pain with palpation and motion at the sternoclavicular joint area.

E.7.e.iii Diagnostic Testing Procedures

A) Plain x-rays of the sternoclavicular joint are routinely done. When indicated, comparative views of the contralateral limb may be necessary.

B) X-rays of other shoulder areas and chest may be done if clinically indicated.

C) CT scan for classification of pathology.

D) Vascular studies should be considered if the history and clinical examination indicate extensive injury.

E.7.e.iv Non-operative Treatment Procedures

A) Symptomatic posterior dislocations should be reduced in the operating room under general anesthesia.

B) Immobilize with a sling for 3 to 4 weeks. Subsequently, further rehabilitation may be utilized using procedures set forth in Section F, Non-operative Treatment Procedures.

C) Medications, such as analgesics and nonsteroidal anti-inflammatories, would be indicated. Narcotics may be indicated acutely for fracture and should be prescribed as indicated in section F.6, Medications.

D) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

E) Refer to comments related to osteoporosis in this Section 7.a. iv. Clavicular fracture.

F) Smoking may affect fracture healing. Patients should be strongly encouraged to stop smoking and provided with appropriate counseling.

E.7.e.v Surgical Indications

Failure of closed reduction.

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.

E.7.e.vi Operative Procedures

- Reduction with soft tissue reconstruction is preferred.
- Internal fixation - significant complications can occur with use of pins due to migration into other tissues.

E.7.e.vii Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist. This program would begin with 4 to 6 weeks of rest with a shoulder immobilizer, followed by therapeutic rehabilitation interventions.

A) Early therapeutic rehabilitation interventions are recommended to maintain ROM with progressive strengthening.

- Frequency: 3 to 5 times per week for the first 2 weeks, 3 times per week for the following 2 weeks, then 1 to 2 times per week.
- Optimum Duration: 6 to 8 weeks with progression to home exercise and/or pool therapy.
- Maximum Duration: 12 weeks. Occasional follow-up visits may be justified to reinforce exercise patterns or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

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

E8. Impingement Syndrome

E.8.a Description/Definition

A collection of symptoms, not a pathologic diagnosis. The symptoms result from the encroachment of the acromion, coracoacromial ligament, coracoid process, and/or the AC joint of the rotator cuff mechanism that passes beneath them as the shoulder is moved. The cuff mechanism is intimately related to the coracoacromial arch. Separated only by the thin lubricating surfaces of the bursa, compression and friction can be minimized by several factors, such as:

- Shape of the coracoacromial arch that allows passage of the subjacent rotator cuff;
- Normal undersurface of the AC joint;

- Normal bursa;
- Normal capsular laxity; and
- Coordinated scapulothoracic function.

The impingement syndrome may be associated with AC joint arthritis and both partial and full thickness rotator cuff tears, as well as, adhesive capsulitis/frozen shoulder. Normal function of the rotator cuff mechanism and biceps tendon assist to diminish impingement syndrome.

History may include:
A) Delayed presentation (since the syndrome is usually not an acute problem). Patients will access care if their symptoms have not resolved with rest, time and "trying to work it out";

B) Complaints of functional losses due to pain, stiffness, weakness and catching when the arm is flexed and internally rotated; and

C) Sleep complaints are common and pain is often felt down the lateral aspect of the upper arm near the deltoid insertion or over the anterior proximal humerus.

E.8.b Occupational Relationship

Repetitive overuse of the upper extremity, often seen with constant overhead motion.

E.8.c Specific Physical Exam Findings

Specific Physical Exam Findings may include:
As with most shoulder diagnoses, the examiner should not rely upon one set of physical exam findings alone due to the lack of specificity and sensitivity of most tests and common overlap of diagnoses.
Physical examination findings may include the following:

1. Range-of-motion is limited particularly in internal rotation and in cross-body adduction, which may reflect posterior capsular tightness. Forward flexion and elevation may also be limited.

2. Passive motion through the 60 to 90 degrees arc of flexion may be accompanied by pain and crepitus. This is accentuated as the shoulder is moved in-and-out of internal rotation.

3. Active elevation of the shoulder is usually more uncomfortable than passive elevation.

4. Pain on maximum active forward flexion is frequently seen with impingement syndrome, but is not specific for diagnosis.

5. Strength testing may reveal weakness of flexion and external rotation in the scapular plane. This weakness may be the result of disuse, tendon damage, or poor scapulothoracic mechanics.

6. Pain on resisted abduction or external rotation may also indicate that the integrity of the rotator cuff tendons may be compromised, causing alteration of shoulder mechanics.

7. Weakness of the posterior scapular stabilizers causing alteration of shoulder mechanics can also contribute to impingement syndrome.

8. If inspection of the shoulder reveals deltoid and rotator cuff atrophy other diagnoses should be suspected such as cervical radiculopathy, axillary nerve pathology, or massive rotator cuff tears.

Impingement syndromes commonly co-exist with other shoulder abnormalities such as rotator cuff tears, AC joint arthritis, biceps tendon ruptures, calcifying tendonitis, bursitis, labral tears, and in older patients, glenohumeral instability. This combination of pathology further complicates diagnostic decisions based mainly on clinical findings. Physicians use a combination of test results with history and other findings to create a differential diagnosis.

Commonly used clinical tests include the following:

- Hawkins;
- Neer;
- Horizontal adduction;
- Drop arm test;
- Yergason's;
- Speed test.

E.8.d Diagnostic Testing Procedures

Plain x-rays include:
A) AP view is useful to evaluate for arthritis and elevation of the humeral head which are not typically present in impingement syndrome.
B) Lateral view in the plane of the scapula or an axillary view can help to determine aspects of instability which can give symptoms similar to impingement syndrome.
C) Axillary view is also useful to demonstrate glenohumeral arthritis and spurs on the anterior inferior acromion.
D) Outlet view determines if there is a downward curved acromion. A downward curved acromion does not necessarily establish the diagnosis of impingement syndrome and is not a sole indication for operative treatment.

Adjunctive testing, sonography or MRI, may be considered when shoulder pain is refractory to 4 to 6 weeks of non-operative conservative treatment and the diagnosis is not readily identified by a good history and clinical examination. (Refer to Section D. Follow-up Diagnostic Procedures.)

The **subacromial injection** has generally been considered the gold standard for differentiating ROM loss from impingement versus rotator cuff tears. Alleviation from pain may help to confirm the diagnosis. Patients with impingement should recover normal strength after the injection, while those with rotator cuff tears usually do not recover normal strength. However, manually tested elevation strength perceived as normal does not always rule out rotator cuff tear and this may contribute to incorrect diagnoses with this technique. There is good evidence that blinded subacromial blocks are not accurate. Up to a third of blinded injections may involve the cuff, and are likely to cause pain. This may lead to an incorrect diagnosis. One study demonstrated that at least half of the positive responders did so up to 40 minutes after the injection. Therefore, a negative response should not be diagnosed until 40 minutes post injection. The inaccuracy of the injection and patient response in some cases may contribute to its inability to completely predict the amount of recovery from subacromial decompression.

If there is a concern regarding needle placement, sonography or fluoroscopy may be used.

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

E.8.e Non-operative Treatment Procedures

i. An aggressive attempt should be made to define the contributing factors which are driving the syndrome, such as shoulder stiffness, humeral head depressor weakness (rotator cuff fiber failure), posterior capsular tightness and subacromial crowding, AC joint arthritis, muscle imbalance, and postural dysfunction.

ii. Benefits may be achieved through therapeutic interventions. They should include ROM, active therapies, 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 and strength of the shoulder girdle musculature. Refer to Section F. Therapeutic Procedures, Non-operative.

iii. There is some evidence that manual therapy at a frequency of 3 times per week for 4 weeks, increases function and decreases pain.

iv. Patients may return to work without overhead activities and lifting with involved arm. An evaluation of the jobsite may be necessary to institute ergonomic changes or accommodations. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

v. Medications, such as nonsteroidal anti-inflammatories and analgesics, should be prescribed. Refer to Section F.6, Medications.

vi. Subacromial space injection may be therapeutic. Injections under significant pressure should be avoided as the needle may be penetrating the tendon and injection into the tendon can cause tendon degeneration, tendon breakdown, or rupture. Injections should be minimized for patients under 30 years of age.

- Time to Produce Effect: One Injection.

- Maximum: 3 injections at the same site per year when functional benefits are demonstrated with each injection.

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

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

E.8.f Surgical Indications

When functional deficits interfere with activities of daily living and/or job duties after 3 to 6 months of active patient participation in non-operative therapy, surgery may restore functional anatomy and reduce the potential for repeated impingement.

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.8.g Operative Procedures

Procedures might include partial coracoacromial ligament release, and an acromioplasty, as well as, repair of associated pathology. An acromioplasty is not always necessary as an adjunct to rotator cuff repair. There is some evidence that patients with a full-thickness rotator cuff tear and Type II acromions do not show appreciable benefit from subacromial decompression.

Coplaning of the clavicle involves the removal of spurs from its inferior surface with the purpose of increasing the space available for movement of the supraspinatus tendon. It is an acceptable procedure. Studies are conflicting regarding possible pain sequelae at the acromioclavicular joint as a consequence of the procedure. In cases with extensive rotator cuff repair, preservation of the coraco–acromial ligament is recommended to maintain joint stability

E.8.h Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F, Therapeutic Procedures, Non-operative. Treatment may include the following:

i. Sling, pillow sling, or abduction splint;

ii. Gentle pendulum exercise, passive glenohumeral range-of-motion, and posterior scapular stabilizing training can be instituted;

iii. Patients can judiciously return to activities as tolerated per physician recommendations. If there is a significant tendon repair, progression will be delayed;

iv. Progressive resistive exercise from 6 to 8 weeks with gradual returning to full activity at 4 to 6 months.

v. Return to work and restrictions after surgery may be made by an experienced primary occupational medicine physician in consultation with the surgeon or by the surgeon. Depending upon the patient's functional response and their job requirements, return to work with job modifications may be considered as early as one week post-operatively, depending on job requirements. The employer must be able to fully accommodate restrictions of overhead activities or heavy lifting.

Work restrictions should be evaluated every 4 to 6 weeks during post-operative recovery and rehabilitation with appropriate written communications to both the patient and the employer. Should progress plateau, the provider should re-evaluate the patient's condition and make appropriate adjustments to the treatment plan.

E9. Osteoarthrosis of the Shoulder (Glenohumeral and Acromioclavicular Joint)

E.9.a Description/Definition

Degenerative joint disease involves any degenerative or age-related changes in any joint. While osteoarthritis (OA) is the more common name for this entity, osteoarthrosis is more technically precise as there is no overt inflammation with redness, swelling, and palpable warmth. Other arthritic disorders that cause joint degeneration include inflammatory disorders (e.g., rheumatoid arthritis, systemic lupus erythematosus, and psoriasis) and crystalline arthropathies (e.g., gout, pseudogout, apatites). As inflammatory and crystalline arthropies are non-occupational, they are not included in this discussion.

Other than intervertebral discs, joints in the body are typically synovial fluid filled, synovium lined, ligamentously encapsulated joints that allow for low friction movement between adjacent bones. OA, an age-related degenerative change in the joint particularly affecting the cartilage on the articular surface, is marked by thinning of that cartilage, osteophyte formation, and subchondral sclerosis.

The shoulder joints are substantially less likely to be affected by degenerative joint disease than other joints such as the knees, hips, spine, or fingers. As with other joints, there are many causes of degenerative findings on x-ray, only one of which is osteoarthrosis. Careful evaluation is required to obtain the correct diagnosis. While most osteoarthrosis cases are not work related, some cases, especially unilateral, ipsilateral post-occupational fracture-related arthroses, are thought to be occupationally related.

E.9.b Occupational Relationship

OA may develop in only one joint after a significant traumatic injury (e.g., fracture), in which case it is often delayed by many years. If this injury was occupational, then the subsequent osteoarthrosis is also considered, at least in part, occupational.

E.9.c Specific Physical Exam Findings

Specific Physical Exam Findings may include the following:

Degenerative joint disease diagnosis requires non-radiating pain and degenerative findings on x-ray. Confirming a diagnosis of osteoarthrosis requires attention to the history, evaluation of other joints, and exclusion of other causes, such as rheumatological or crystal disorders.

E.9.d Diagnostic Testing Procedures

X-Rays

E.9.e Non-operative Treatment Procedures

Non-operative Treatment Procedures may include:

i. Procedures outlined in Section F.

ii. Medication, such as non-steroidal anti-inflammatories and analgesics would be indicated.

Judicious use of opioids is recommended for pain management for select patients with severe osteoarthrosis.

Capsicum, tricyclic antidepressants or dual reuptake inhibiting anti-depressants for chronic pain (but not SSRI antidepressants which are not effective for nociceptive pain), and gabapentin for peri-operative use are recommended for select use to control pain associated with osteoarthrosis.

Refer to chronic pain guidelines.

iii. Injections:
A) Intraarticular glucocorticosteroid injections are recommended for treatment of shoulder osteoarthrosis

Indications –Glenohumeral or acromioclavicular joint pain from osteoarthrosis sufficient that control with NSAIDs, acetaminophen, and potentially exercise is unsatisfactory.

B) Intraarticular glenohumeral viscosupplementation injections are recommended for treatment of shoulder osteoarthrosis.

- Indications –Shoulder joint pain from osteoarthrosis to the extent that control with NSAID(s), acetaminophen and exercise strategies is unsatisfactory. Patients should generally have failed treatment with glucocorticosteroid injection. Similar to glucocorticosteroid injections, the usual purpose is to gain sufficient relief to either

resume conservative medical management or to delay surgical intervention. Injections are recommended to be performed under either ultrasound or fluoroscopic guidance.

- Dose – No apparent difference in outcomes for high vs. low molecular weight preparations elsewhere in the body.

- Frequency/Duration – One injection approximately every 7 to 14 days; up to 5 injections.

iv. Benefits may be achieved through therapeutic rehabilitation. Refer to Section F, Therapeutic Procedures, Non-operative.

v. Glenohumeral and AC joint osteoarthroses generally do not require work limitations. Occasionally limitations are required in severe cases to preclude symptomatic aggravation especially for more physically demanding work such as preventing overhead use, lifting of more than 15 pounds, repeated forceful use, and/or avoidance of other activities that significantly increase symptoms. Shoulder arthroplasty generally precludes return to physically demanding work. Refer to Section F. 12, Return to Work.

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

E.9.f Surgical Indications

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. The patient should also agree to comply with the pre- and post-operative treatment plan and home exercise requirements and understand the length of partial and full-disability expected post-operatively.

E.9.g Operative Procedures

i. Arthroscopy is recommended for evaluation and treatment of shoulder osteoarthrosis particularly when an associated disorder is felt to be present, symptomatic, and treatable. See related diagnoses as discussed above

ii. Distal clavicle resection either arthroscopic or open treatment of acromioclavicular joint pain has some evidence for recommendation.

- Indications – X-ray or other imaging evidence of acromioclavicular degenerative joint disease and/or confirmation with a local anesthetic injection relieving all or nearly all pain. Patients should have reproducible acromioclavicular joint pain with insufficient pain relief with NSAIDs, activity modification, and injection(s).

E.9.h Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F-Therapeutic Procedures, Non-operative.

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

E9. Osteoarthrosis of the Shoulder (Glenohumeral and Acromioclavicular Joint)

E.9.a Description/Definition

Degenerative joint disease involves any degenerative or age-related changes in any joint. While osteoarthritis (OA) is the more common name for this entity, osteoarthrosis is more technically precise as there is no overt inflammation with redness, swelling, and palpable warmth. Other arthritic disorders that cause joint degeneration include inflammatory disorders (e.g., rheumatoid arthritis, systemic lupus erythematosus, and psoriasis) and crystalline arthropathies (e.g., gout, pseudogout, apatites). As inflammatory and crystalline arthropies are non-occupational, they are not included in this discussion.

Other than intervertebral discs, joints in the body are typically synovial fluid filled, synovium lined, ligamentously encapsulated joints that allow for low friction movement between adjacent bones. OA, an age-related degenerative change in the joint particularly affecting the cartilage on the articular surface, is marked by thinning of that cartilage, osteophyte formation, and subchondral sclerosis.

The shoulder joints are substantially less likely to be affected by degenerative joint disease than other joints such as the knees, hips, spine, or fingers. As with other joints, there are many causes of degenerative findings on x-ray, only one of which is osteoarthrosis. Careful evaluation is required to obtain the correct diagnosis. While most osteoarthrosis cases are not work related, some cases, especially unilateral, ipsilateral post-occupational fracture-related arthroses, are thought to be occupationally related.

E.9.b Occupational Relationship

OA may develop in only one joint after a significant traumatic injury (e.g., fracture), in which case it is often delayed by many years. If this injury was occupational, then the subsequent osteoarthrosis is also considered, at least in part, occupational.

E.9.c Specific Physical Exam Findings

Specific Physical Exam Findings may include the following:

Degenerative joint disease diagnosis requires non-radiating pain and degenerative findings on x-ray. Confirming a diagnosis of osteoarthrosis requires attention to the history, evaluation of other joints, and exclusion of other causes, such as rheumatological or crystal disorders.

E.9.d Diagnostic Testing Procedures

X-Rays

E.9.e Non-operative Treatment Procedures

Non-operative Treatment Procedures may include:

i. Procedures outlined in Section F.

ii. Medication, such as non-steroidal anti-inflammatories and analgesics would be indicated.

Judicious use of opioids is recommended for pain management for select patients with severe osteoarthrosis.

Capsicum, tricyclic antidepressants or dual reuptake inhibiting anti-depressants for chronic pain (but not SSRI antidepressants which are not effective for nociceptive pain), and gabapentin for peri-operative use are recommended for select use to control pain associated with osteoarthrosis.

Refer to chronic pain guidelines.

iii. Injections:
A) Intraarticular glucocorticosteroid injections are recommended for treatment of shoulder osteoarthrosis

Indications –Glenohumeral or acromioclavicular joint pain from osteoarthrosis sufficient that control with NSAIDs, acetaminophen, and potentially exercise is unsatisfactory.

B) Intraarticular glenohumeral viscosupplementation injections are recommended for treatment of shoulder osteoarthrosis.

- Indications –Shoulder joint pain from osteoarthrosis to the extent that control with NSAID(s), acetaminophen and exercise strategies is unsatisfactory. Patients should generally have failed treatment with glucocorticosteroid injection. Similar to glucocorticosteroid injections, the usual purpose is to gain sufficient relief to either resume conservative medical management or to delay surgical intervention. Injections are recommended to be performed under either ultrasound or fluoroscopic guidance.

- Dose – No apparent difference in outcomes for high vs. low molecular weight preparations elsewhere in the body.

- Frequency/Duration – One injection approximately every 7 to 14 days; up to 5 injections.

iv. Benefits may be achieved through therapeutic rehabilitation. Refer to Section F, Therapeutic Procedures, Non-operative.

v. Glenohumeral and AC joint osteoarthroses generally do not require work limitations. Occasionally limitations are required in severe cases to preclude symptomatic aggravation especially for more physically demanding work such as preventing overhead use, lifting of more than 15 pounds, repeated forceful use, and/or avoidance of other activities that significantly

increase symptoms. Shoulder arthroplasty generally precludes return to physically demanding work. Refer to Section F. 12, Return to Work.

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

E.9.f Surgical Indications

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. The patient should also agree to comply with the pre- and post-operative treatment plan and home exercise requirements and understand the length of partial and full-disability expected post-operatively.

E.9.g Operative Procedures

i. Arthroscopy is recommended for evaluation and treatment of shoulder osteoarthrosis particularly when an associated disorder is felt to be present, symptomatic, and treatable. See related diagnoses as discussed above

ii. Distal clavicle resection either arthroscopic or open treatment of acromioclavicular joint pain has some evidence for recommendation.

- Indications – X-ray or other imaging evidence of acromioclavicular degenerative joint disease and/or confirmation with a local anesthetic injection relieving all or nearly all pain. Patients should have reproducible acromioclavicular joint pain with insufficient pain relief with NSAIDs, activity modification, and injection(s).

E.9.h Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F-Therapeutic Procedures, Non-operative.

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

E10. Osteonecrosis - Shoulder Injury

E.10.a Description/Definition

Osteonecrosis, or avascular necrosis, is a complex pathological process involving increased bone marrow pressure and ischemia with loss of vascular supply to the bone with subsequent bone death initiated by vascular occlusion. It tends to occur in areas of the body with more tenuous blood supply, including the heads of the femur, humerus, and other ends of long bones, although it can occur in any bone. If the process advances, the bone collapses. The greatest risk for osteonecrosis of the humerus is believed to be glucocorticosteroid use or endogenous excess. And, similar to the hip, other risk factors appear to include diabetes mellitus, arteriovascular

disease, hyperlipidemia, sickle cell anemia, coagulopathies, Gaucher's disease, HIV, alcoholism, and smoking. Many cases are idiopathic; genetic factors are also believed to be important.

The disease is likely, not invariably, progressive – in the hip there appears to be potential for recovery at any of the early stages; the same is thought to be true for the humerus.

E.10.b Occupational Relationship

Some cases are considered occupational disorders, particularly in the setting of dysbarism (atmospheric compression, decompression). Workers at risk include divers and others in compressed air atmospheres who experience impaired blood supply to the bone due to nitrogen gas in the blood during excessively rapid decompression. Major trauma is another reported cause. Thus, if a humeral fracture is occupational, a subsequent case of osteonecrosis arising out of that humeral fracture is usually considered occupational. Whether or not stereotypical forceful use of the joint is a risk is speculative.

E.10.c Specific Physical Exam Findings

Specific Physical Exam Findings may include the following:

In osteonecrosis, there appears to be a clinically silent, pre-clinical state (most frequently identified in the asymptomatic hip) that when found first in the shoulder is often present elsewhere, such as in the hips or knees. Patients present with either acute or insidious onset of persistent shoulder pain worsened by overhead use. Pain is often worse at night and might be somewhat worse with activity. Reduced shoulder ROM can occur and will nearly always be present if there is bony collapse. Pain and ROM worsen as the degree of impairment progresses.

E.10.d Diagnostic Testing Procedures

MRI is recommended for diagnosing osteonecrosis in patients with subacute or chronic shoulder pain thought to be related to osteonecrosis (AVN), particularly in whom the diagnosis is unclear or in whom additional diagnostic evaluation and staging is needed.

Bone scanning is recommended for select use where there is more than one joint to be evaluated in patients with acute, subacute, or chronic pain to assist in the diagnosis of osteonecrosis or other conditions with increased bone metabolism.

CT is recommended for the evaluation of select patients with osteonecrosis, particularly in whom subchondral fractures are being sought. It is also recommended for those who need advanced imaging, but have contraindications for MRI. Otherwise, MRI is thought to be superior.

Helical CT is recommended for evaluation of patients with osteonecrosis who have contraindications for MRI. E11. Pectoral Muscle Strain & Tears

E11. Pectoral Muscle Strain & Tears - Shoulder Injury

E.11.a Description/Definition

There can be actual tendon avulsion of the sternal head of pectoralis major (rarely entire including clavicular head) or injury a myotendinous or intra muscular site. (The term “strain” is sometimes erroneously utilized to label virtually any muscle pain or ache, rather than the denotation of a muscle-tendon junction partial or complete disruption.) There are no quality studies evaluating treatment for these disorders. As these strains are true muscle-tendon unit strains, limitations are particularly indicated to alleviate forceful exertions while allowing sufficient time to health the strain (see Rotator Cuff Tendinopathies).

E.11.b Occupational Relationship

Pectoral muscle tears or strains usually occur in the course of overwhelming force, particularly in athletics involved in football or weight lifting. The most common mechanism is tear while bench pressing heavy weight or similar trauma with eccentric loading of the major muscle.

E.11.c Surgical Indications

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. The patient should also agree to comply with the pre- and post-operative treatment plan and home exercise requirements and understand the length of partial and full-disability expected post-operatively.

E.11.d Operative Procedures

Surgery is recommended for patients with complete tears or ruptures of the pectoralis insertion.

E.11.e Post-operative Treatment

An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatments found in Section F-Therapeutic Procedures, Non-operative.

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

E12. Rotator Cuff Tear

E.12.a Description/Definition

Partial or full-thickness tears of the rotator cuff tendons, most often the supraspinatus, can be caused by vascular, traumatic or degenerative factors or a combination. Further tear classification includes: a small tear is less than 1cm; medium tear is 1 to 3cm; large tear is 3 to 5cm; and massive tear is greater than 5cm, usually with retraction. Partial thickness cuff tears usually

occur in age groups older than 30. Full-thickness tears can occur in younger age groups. Patient usually complains of pain along anterior, lateral shoulder or posterior glenohumeral joint.

E.12.b Occupational Relationship

May be caused by 1) sudden trauma to the shoulder such as breaking a fall using an overhead railing or an out-stretched arm; or 2) chronic overuse with repetitive overhead motion or heavy lifting; or 3) moderate lifting in de-conditioned workers.

E.12.c Specific Physical Exam Findings

Specific Physical Exam Findings may include:

Partial Thickness Tear:
A) There may be pain at the end of range-of-motion (ROM) when full passive ROM for abduction, elevation, external rotation and internal rotation are obtainable;

B) Occasionally, there is a restriction of passive motion in one or more planes;

C) Active ROM will be limited and painful for abduction and external rotation, as well as internal rotation and forward flexion;

D) A painful arc may be present with active elevation;

E) Pain will be positive for resisted tests (abduction, flexion, external rotation, internal rotation, abduction/internal rotation at 90 degrees, and abduction/external rotation at 45 degrees); and/or

F) There may be positive impingement signs, refer to Section E.8, Impingement Syndrome.

Full-Thickness Tear:
A) Passive and resisted findings are similar to those for partial thickness tears with greater weakness of abduction and external rotation;

B) Active elevation may be severely limited with substitution of scapular rotation;

C) Occasionally strength remains well preserved.

Rotator cuff tears commonly co-exist with other shoulder abnormalities such as impingement, AC joint arthritis, bicep tendon ruptures, calcifying tendonitis, and older patients with glenohumeral instability, bursitis, and labral tears. This combination of pathology further complicates diagnostic decisions based mainly on the clinical findings. Full-thickness tears are usually readily apparent from the drop arm test or weakness with elevation. For other diagnoses, physicians should use a combination of test results with history and other findings to create a differential diagnosis. The following tests may be used:

- Hawkins.

- Drop Arm.
- Lift Off.
- Subscapularis Strength Test.
- Empty Can Test.
- External Rotation Lag Test.

Neurological lesions can occur with rotator cuff tears or may be missed as isolated lesions. When muscle atrophy and weakness are present, the physician should consider neurologic lesions in the differential diagnoses.

E.12.d Diagnostic Testing Procedures

i. AP view is useful to evaluate for arthritis and elevation of the humeral head. Superior migration of the humeral head is indicative of an extensive, and possibly irreparable, rotator cuff tear.

ii. Lateral view in the plane of the scapula or an axillary view can help to determine aspects of instability which can give symptoms similar to impingement syndrome.

iii. The axillary view is also useful to demonstrate glenohumeral arthritis and spurs on the anterior inferior acromion.

iv. Outlet view determines if there is a downward curved acromion. A downward curved acromion does not necessarily establish the diagnosis of impingement syndrome and is not a sole indication for operative treatment.

Cases with the presence of significant weakness on elevation or rotation, a palpated defect at the greater tuberosity or a traumatic history should have early MRI. Adjunctive testing such as sonography or MRI should be considered for other shoulder cases refractory to 4 to 6 weeks of non-operative conservative treatment. Sonography may be better at detecting partial thickness tears but is operator dependent. The sonogram is very specific for rotator cuff tears but is not sensitive.

Rotator cuff tears, both full-thickness and partial, appear to occur commonly in asymptomatic individuals. Sonographic diagnostic criteria for rotator cuff tear may be met in approximately 39% of asymptomatic persons, and MRI criteria for rotator cuff tear may occur in approximately 26% of asymptomatic persons. There also appears to be a linear trend with age, such that more than half of asymptomatic individuals over the age of 60 may demonstrate imaging changes consistent with rotator cuff tear, while a small minority of patients younger than 40 demonstrate these changes. Correlation of radiological and clinical findings is an important part of patient management.

E.12.e Non-operative Treatment Procedures

i. Medications, such as nonsteroidal anti-inflammatories and analgesics, would be indicated. Acute rotator cuff tear may indicate the need for limited narcotics use.

ii. Relative rest initially and procedures outlined in Section F, Non-operative Treatment Procedures. Therapeutic rehabilitation interventions may include ROM and use a home exercise program and passive modalities for pain control. Therapy should progress to strengthening and independent home exercise programs targeted to ongoing ROM and strengthening of shoulder girdle musculature.

iii. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

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

E.12.f Surgical Indications

Goals of surgical intervention are to restore functional anatomy by re-establishing continuity of the rotator cuff, addressing associated pathology and reducing the potential for repeated impingement.

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.

If no increase in function for a partial tear is observed after 6 to 12 weeks, a surgical consultation is indicated. For full-thickness tears it is thought that early surgical intervention produces better surgical outcome due to healthier tissues and often less limitation of movement prior to and after surgery. Patients may need pre-operative therapy to increase ROM.

Full- thickness tears in individuals less than 60 should generally be repaired. Surgery for partial thickness tears has variable results and debridement should be performed early in younger active patients. Many patients with partial tears and good ROM and strength recover well without surgery. In patients over 65 the decision to repair a full rotator cuff tear depends on the length of time since the injury, the amount of muscle or tendon that has retracted, the level of fatty infiltration and the quality of the tendon. Procedures for these patients may include biceps tendon repair and shaving of the humeral tuberosity. For patients with lack of active elevation above 90 degrees, arthroscopic biceps tenotomy and tenodesis may be effective in returning some elevation. Recurrence rate may be up to 50% in older patients with multiple tendon full-thickness tears. Pseudo paralysis or severe rotator cuff arthropathy are contraindications to the procedure.

Literature suggests that the presence of three of the following factors may decrease the likelihood of a successful repair: 1) decreased passive ROM, 2) superior migration of the humeral head, 3) presence of atrophy, 4) and/or external rotation/abduction weakness strength. Presence of these conditions is not necessarily contraindications to surgery, however, the patient should be made aware that the outcome may be less predictable.
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 and home exercise requirements. The patient should understand the length of partial and full disability expected post-operatively.

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

E.12.g Operative Procedures

Options would include arthroscopic or open debridement and/or repair. In some cases, partial coracoacromial ligament release, and/or anterior acromioplasty.

An acromioplasty is not always necessary as an adjunct to rotator cuff repair. There is some evidence that patients with a full-thickness rotator cuff tear and Type II acromions do not show appreciable benefit from subacromial decompression.

Coplaning of the clavicle involves the removal of spurs from its inferior surface with the purpose of increasing the space available for movement of the supraspinatus tendon. It is an acceptable procedure. Studies are conflicting concerning the consequences of the procedure for the stability of the acromioclavicular joint.

Distal clavicular resection is not recommended for patients without AC joint pain.

In cases with extensive rotator cuff tear, preservation of the coracoacromial ligament is recommended to prevent instability.

Arthroscopic laser treatment is not recommended due to lack of evidence regarding outcomes.

E.12.h Post-operative Treatment

Individualized rehabilitation program based upon communication between the surgeon and the therapist. Treatment may include the following:

i. Sling, pillow sling, or abduction splint. Sling protection for a period of two to eight weeks is usually recommended after rotator cuff repair;

ii. Gentle pendulum exercise, passive glenohumeral range-of-motion in flexion and external rotation to prevent adhesions and maintain mobilization;

iii. Isometrics and activity of daily living skills usually being 6 weeks post-operatively.

iv. Active assisted range-of-motion exercises in supine with progression to sitting;

v. Light resistive exercise may begin at 6 to 12 weeks, depending on quality of tissue and surgeon’s discretion;

vi. Pool exercise initially under therapists or surgeon’s direction then progressed to independent

pool program;

vii. Progression to a home exercise program is essential;

viii. Gradual resistive exercise from 3 to 12 months, with gradual return to full activity at 6 to 12 months;

ix. Time frames for therapy (excluding pool therapy).

- Optimum: 24 to 36 sessions.
- Maximum: 48 sessions. If functional gains are being achieved additional visits may be authorized for the patient to achieve their functional goal.

x. Continuous passive motion is not generally recommended. It may be used if the patient has no home assistance to regularly perform the passive movements required in the first 6 weeks and/or access to therapy is limited.

xi. Should progress plateau, the provider should re-evaluate the patient's condition and make appropriate adjustments to the treatment plan. Refer to Section F for other therapies that may be employed in individual cases.

xii. Return to work and restrictions after surgery may be made by an experienced primary occupational medicine physician in consultation with the surgeon or by the surgeon. Work restrictions should be evaluated every 4 to 6 weeks during post-operative recovery and rehabilitation with appropriate written communications to both the patient and employer. Return to full-duty too early in the course of tendon recovery increases the likelihood of recurrent, symptomatic tears. Animal models estimate that the infraspinatus tendon regains only 30% of strength at 6 weeks, 50% at 3 months, and 80% at 6 months. Therefore, return to any significant lifting early in the course of recovery may result in failure of the surgery and/or recurrent tears.

E13. Shoulder Instability/Glenohumeral Instability

E.13.a Description/Definition

Subluxation (partial dislocation), or dislocation of the glenohumeral joint in either an anterior, interior, posterior or a combination of positions.

History may include:

- A slipping sensation in the arm;
- Severe pain with inability to move the arm;
- Abduction and external rotation producing a feeling that the shoulder might "come out"; or

- Feeling of shoulder weakness.

E.13.b Occupational Relationship

Instability may be caused by any of the following:

- A direct traumatic blow to the shoulder;
- A fall on an outstretched arm;
- Performing repetitive forceful overhead activities similar to pitching baseball;
- A significant traction injury to the arm.

In cases of subluxation symptoms may be exacerbated or provoked by work and initially alleviated with a period of rest. Symptoms may also be exacerbated by other activities that are not necessarily work related (e.g., driving a car or sports).

E.13.c Specific Physical Exam Findings

Specific Physical Exam Findings may include:

i. Anterior dislocations may exhibit loss of normal shoulder contour; fullness in the axilla and pain over the shoulder with any motion. The patient may hold the extremity in a static position;

ii. Posterior dislocations usually occur with a direct fall on the shoulder or outstretched arm resulting in posteriorly directed forces to the humeral head. Seizures or electrocution may also cause posterior dislocations. Patients present with inability to externally rotate the shoulder;

iii. Neurologic examination may reveal findings consistent with axillary nerve injuries, musculocutaneous nerve injuries, generalized brachioplexopathies or other entrapment neuropathies;

iv. Abduction and external rotation positioning classically produces apprehension in those who have anterior instability. This finding may be present with other diagnoses. If apprehension is reproduced and then relieved with positive posterior pressure after a positive first maneuver, this is considered a positive relocation test. As with all shoulder diagnoses, a combination of physical findings and history should guide the provider in determining the final diagnoses. Direct posterior stress may produce pain and apprehension in those with posterior instability;

v. The contralateral joint should always be examined. Patients who have laxity in multiple positions, who have contralateral joint laxity or who have increased external rotation (90 degrees or more) with the arm at the side are not likely to be surgical candidates and can be treated conservatively.

vi. Other clinical findings (described in the Initial Diagnostic Procedures Section C):

- Sulcus sign.
- Inferior instability.
- Posterior instability.
- Apprehension, also known as crank, fulcrum or Feagin.
- Relocation.
- Load and shift or anterior and posterior drawer.

E.13.d Diagnostic Testing Procedures

- Plain x-rays to rule out bony deficit on the glenoid, including AP, axillary view, lateral in the plane of the scapula and possibly the West Point view. Axillary view to identify larger Hill-Sachs lesion of humeral head.
- More difficult diagnostic cases with subtle history and physical findings suggesting instability, rotator cuff or labral tear, may require a MRI or a CT arthrogram. This imaging may be useful to evaluate for labral detachment and capsular stress injury or laxity after 4 to 8 weeks of active patient involvement in therapy.
- Suspected rotator cuff tear cases may require diagnostic arthroscopy.

E.13.e Non-operative Treatment Procedures

In subacute and/or chronic instabilities, age of onset of instability is an important part of the history. Older patients are less likely to have recurrent dislocations unless they have associated large rotator cuff tears.

Therefore, the rotator cuff tear protocol should be followed if there is a suspicion of this pathology. Associated axillary nerve injuries are more common in older patients. Patients less than 30 years of age, especially males actively participating in sports, tend to have a higher recurrence rate, up to 75% in some series. Surgery should be considered for these patients after the first dislocation.

Avoid any aggressive treatment in patients with history of voluntary subluxation or dislocation. These patients may need a psychiatric evaluation. Patient may not return to work with overhead activity or lifting with involved arm until cleared by physician for heavier activities.

i. **First-time dislocation**:
A) Immobilization. There is no evidence that immobilization beyond splinting for comfort initially affords any additional treatment advantage thus, it is not routinely required. Literature using MRI has shown that the Bankart lesion is separated from the bone in internal rotation and apposed to the bone in external rotation. There is some evidence that immobilization for 3 weeks with the shoulder in adduction and approximately 10 degrees of external rotation reduces the risk

of recurrent dislocation. Decisions concerning external rotation splinting versus other options will depend on surgeon and patient preferences.
B) Consider surgical intervention for young patients active in sports, or older patients with significant rotator cuff tears. If additional pathology is present consult appropriate diagnostic categories.
C) Medications such as analgesics and anti-inflammatories may be helpful. (Refer to medication discussions in Section F.6)
D) Other therapeutic procedures may include instruction in therapeutic exercise and proper work techniques, evaluation of occupational work station and passive modalities for pain control. (Refer to Section F Therapeutic Procedures-Non operative, for specific time parameters.)
E) Additional treatment may include, depending on level of improvement, manual therapy techniques, work conditioning and other treatment found in section F.
F) Patient may not return to work with overhead activity or lifting with involved arm until cleared by physician for heavier activities. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

ii. **Acute or chronic dislocations**: with a fracture contributing to instability;
Practitioner should immobilize dislocations if in an acceptable position. Consultation should be obtained as surgical repair may be necessary.

Return-to-work will be directly related to the time it takes the fracture to heal.

iii. **Subacute and/or chronic instability**:
Chronic dislocations should first be treated similarly to acute dislocation. If continuing treatment is unsuccessful, with findings of instability, operative repair should be considered.

E.13.f Surgical Indications

Identify causative agent for the instability (i.e., labral detachment, bony lesion, large rotator cuff tear, subscapularis tendon rupture, or multi-directional instability). There is strong evidence that initial operative repair in young active patients results in fewer recurrent dislocations, thus, operative repair should be considered for these patients. Those with Hill Sachs lesions, bony Bankart injuries, or significant glenoid bone loss have a worse prognosis for recurrences.

Fractures not amenable to immobilization may also need operative management after the first dislocation. Even with open repairs some decrease in function should be expected. Loss of external rotation is common. In some cases the loss of motion may have an adverse effect on post-operative function. The desire for surgery should carefully balance the desire to prevent recurrent dislocations and the need for ROM.

Older patients with documented large rotator cuff tears should also be considered for operative repair after first time dislocations. Repair of the rotator cuff tear alone or in combination with stabilization should be considered. Refer to the rotator cuff tear section E.9.

In general, older patients without the above lesions will suffer few recurrences, and therefore, are treated conservatively. Operative repair may be considered only after recurrent dislocations when functional deficits interfere with activities of daily living and/or job duties and active patient

participation in non-operative therapy has occurred. Patients with multi-directional laxity and/or laxity in the contralateral shoulder are usually not good candidates for operative repair.

E.13.g Operative Procedures

1. Bankart lesion repair; or

2. Capsular tightening. There is no evidence of benefit from thermal capsulorrhaphy and it is not recommended;

3. Bony block transfer;

E.13.h Post-operative Treatment

i) An individualized rehabilitation program based upon communication between the surgeon and the therapist. Depending upon the type of surgery, the patient will be immobilized for 3 to 6 weeks.

ii) As soon as it is safe to proceed without damaging the repair, begin therapeutic exercise. Pool therapy may be beneficial. Refer to Section F, Therapeutic Procedures, Non-operative for other therapies.)

iii) During this period of time, the patient could resume working when the surgeon has cleared the patient for specific activities and appropriate modifications can be made in the workplace. Return to work and restrictions after surgery may be made by an experienced primary occupational medicine physician in consultation with the surgeon or by the surgeon. Full ROM, lifting and pushing are prohibited usually for at least 3 months. Overhead work may be restricted up to 6 months.

iv) MMI can be expected 3 months after non-operative treatment and 6 to 12 months after operative treatment. Further job assessment and adjusted work restrictions may be needed prior to the patients return to full-duty.

E14. Shoulder Pain, Non-Specific

E.14.a Description/Definition

Strain is the term is occasionally used to describe non-specific muscle pain in the absence of knowledge of an anatomic pathophysiological correlate. A strain is the disruption of a myotendinous junction or sometimes of a muscle, usually from a high-force unaccustomed exertion. It may also occur during an accident.

E.14.b Occupational Relationship

There are no quality studies documenting that non-specific shoulder pain is or is not an occupational condition. Non-specific pain has been associated with keyboarding. In non-specific shoulder pain, psychosocial issues including depression and stress are more prevalent. There is

evidence that non-specific shoulder pain is also commonly related to sports, particularly swimming.

E.14.c Specific Physical Exam Findings

Specific Physical Exam Findings may include the following:

Some cases of shoulder pain do not clearly fit diagnostic criteria and are considered non-specific. These cases may resolve prior to identifying a clear diagnosis or a specific diagnosis may become clear with time.

E.14.d Diagnostic Testing Procedures

i. X-rays.

ii. Bone scanning is recommended for select use where there is more than one joint to be evaluated to assist in the diagnosis of conditions with increased bone metabolism.

iii. Helical CT is recommended for select patients in whom advanced imaging of bony structures is thought to potentially be helpful. It is also recommended for those who need advanced imaging, but have contraindications for MRI.

iv. Diagnostic arthroscopy is recommended for evaluation of carefully select patients with shoulder pain. (See Operative Procedures below.)

v. Antibody levels are recommended to evaluate and diagnose patients with shoulder pain that have reasonable suspicion of rheumatological disorder. However, ordering of a large, diverse array of antibody levels without targeting a few specific disorders diagnostically is not recommended.

vi. Erythrocyte sedimentation rate and other inflammatory markers are recommended for screening for inflammatory disorders with reasonable suspicion of inflammatory disorder in patients with subacute or chronic shoulder pain. However, ordering of a large, diverse array of anti-inflammatory markers without targeting a few specific disorders diagnostically is not recommended.

E.14.e Non-operative Treatment Procedures

Non-operative Treatment Procedures may include:

i. Procedures outlined in Section F.

ii. Medication, such as non-steroidal anti-inflammatories and analgesics would be indicated. Refer to Section F. Medications.

iii. Benefits may be achieved through therapeutic rehabilitation. Refer to Section F, Therapeutic Procedures, Non-operative.

iv. Allow all activities as tolerated – consider modification of activities that aggravate symptoms. Refer to Section F. 12, Return to Work.

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

E.14.f Surgical Indications

Surgical interventions are appropriate when patients meet other diagnostic criteria outlined in the guidelines.

E15. Superior Labrum Anterior and Posterior (SLAP) Lesions

E.15.a Description/Definition

Lesions of the superior aspect of the glenoid labrum that extend anteriorly and posteriorly in relation to the biceps tendon insertion. There are several different types of SLAP lesions described.

1. Type I is a fraying of the superior labral edge without detachment of the labrum from the glenoid rim.

2. Type II is a detachment of the biceps anchor from the glenoid. Three distinct Type II lesions have been described as anterior only, posterior only, or combined anterior and posterior.

3. Type III is a bucket handle tear in the superior labrum only with biceps tendon and remainder of the superior labrum having stable attachment.

4. Type IV is a bucket handle tear as in Type III, but with extension of the tear in to the biceps tendon. Additional types of lesions have been described that include extensions of the above-described lesions or extensions of Bankart lesions.

History may include:

- Symptoms with overhead throwing motions;
- Dislocation, subluxation, or subjective sense of instability;
- Poorly localized shoulder pain that is exacerbated by overhead activities;
- Catching, locking, popping or snapping;
- Subtle instability.

E.15.b Occupational Relationship

Common mechanisms of injury that are thought to contribute to SLAP lesions include: 1) compression injury such as fall on an outstretched arm with the shoulder in forward flexion and abduction or direct blow to the glenohumeral joint; 2) traction injury such as repetitive overhead throwing, attempting to break a fall from a height, and sudden pull when losing hold of a heavy object; 3) driver of an automobile who is rear ended; 4) repetitive overhead motions with force such as pitching; or 5) a fall on adducted arm with upward force directed on elbow. In some cases no mechanism of injury can be identified.

E.15.c Specific Physical Exam Findings

The physical examination is often nonspecific secondary to other associated intra-articular abnormalities. No one test or combination of tests has been shown to have an acceptable sensitivity and specificity or positive predictive values for diagnosing SLAP lesion. Sensitivity and specificity are relatively low for individual tests and combinations.
Overall physical examination tests for SLAP lesions may be used to strengthen a diagnosis of SLAP lesion, but the decision to proceed to operative management should not be based on physical examination alone. Refer to Section C. 1, Initial Diagnostic Procedures for specific descriptions of these signs and tests.

- Speed Test.
- Yergason's Test.
- Active Compression (O'Brien) Test.
- Jobe Relocation Test.
- Crank Test.
- Anterior Apprehension Maneuver.
- Tenderness at the bicipital groove.
- Anterior Slide (Kibler) Test.
- Compression Rotation Test.
- Pain Provocation Test.
- Biceps Load Test II.

E.15.d Diagnostic Testing Procedures

1. Radiographs are usually normal in isolated SLAP lesions. However, they can be useful in identifying other sources of abnormalities.

2. Magnetic resonance imaging with arthrogram has the highest reported accuracy for both diagnosis and classification of SLAP lesions; however, it may be difficult to differentiate

SLAP lesions, especially Type II lesions, from normal anatomic variants and from asymptomatic age related changes.

3. Arthroscopic evaluation is the most definitive diagnostic test.

E.15.e Non-operative Treatment Procedures

Most SLAP lesions are associated with other pathology such as rotator cuff tears, Bankart lesions, joint instability, biceps tendon tears, and supraspinatus tears. The provider should refer to the treatment protocols for these conditions and follow both the surgical and non surgical recommendations. For suspected isolated SLAP lesions, non invasive care, consider the following.

i. Medications such as analgesics and anti-inflammatories may be helpful. (Refer to medication discussions are in Section F.6, Medications.)

ii. Therapeutic procedures may include instruction in therapeutic exercise and proper work techniques, evaluation of occupational work station.

iii. Benefits may be achieved through therapeutic rehabilitation and rehabilitation interventions. They should include range-of-motion (ROM), active therapies, 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 and strength of the shoulder girdle musculature. (Refer to Section F., Therapeutic Procedures, Non-operative.)

iv. Subacromial bursal and/or glenohumeral 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.

v. Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F. 12, Return to Work.

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

E.15.f Surgical Indications

There is a significant amount of normal anatomic variation of the superior glenoid labrum and origin of the long head of the biceps tendon. Differentiation between normal variation and

pathology is imperative.

i. The physician should identify other shoulder pathology if any exists and follow the appropriate surgical indications. If a SLAP lesion is suspected, an arthroscopic exam should be performed in conjunction with the primary surgical procedure and an appropriate repair performed if necessary. See Section E, Specific Diagnosis Testing, & Treatment related sections.
or
ii. When no additional pathology is identified and there is an inadequate response to at least three months of non-operative management with active patient participation as evidenced by continued pain with functional limitations and/or instability significantly affecting activities of daily living or work duties;

iii. 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 and home exercise requirements. The patient should understand the length of partial and full disability expected post-operatively. The patient should also understand that 1) non-operative treatment is an acceptable option and that 2) a potential complication of the surgery is shoulder stiffness with pain and possibly decreased function.

E.15.g Operative Procedures

Operative treatment of SLAP lesions depends on the type of lesion present and whether any other intra-articular abnormalities are present. The following are generally accepted protocols for surgical intervention; however, due to current lack of evidence, operative treatment is not limited to these.

1. Type I: Debridement is reasonable but not required;

2. Type II: Repair via suture anchors or biceps tenotomy are reasonable options;

3. Type III: Debridement or excision of the bucket handle component alone or repair via suture anchors or biceps tenotomy/tenodesis are reasonable options;

4. Type IV: Debridement and/or biceps tenotomy or tenodesis are reasonable options.

E.15.h Post-operative Treatment

Post-operative rehabilitation programs should be individualized and dependent upon whether any other intra-articular abnormalities exist and were operatively treated. There is a paucity of information on rehabilitation of isolated SLAP lesions. Common post-operative care involves wearing a sling, without active shoulder motion for 4 to 6 weeks. Elbow, wrist, and hand range-of-motion (ROM) exercises may be used at this time. The sling is removed at 4 to 6 weeks and active ROM is usually begun with restrictions directed by the surgeon. It is reasonable to restrict external rotation and abduction up to six months post-operative.

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

E16. Trigger Points/Myofascial Pain

E.16.a Description/Definition

"Tender points" is a term used to characterize unusually tender areas of muscle, tendon, or over boney prominences that reproduce the patient's pain when palpated. Trigger points include those points with tenderness, "knots" of muscle or overlying connective tissue, reproduction of the patient's pain when palpated, and elicitation of symptoms distally during palpation. As the diagnostic entity heavily relies upon subjective complaints without purely objective findings, the existence of this condition has been questioned.

Patients with muscle tenderness are often given the diagnosis of "myofascial pain." This terminology was initially developed to characterize patients presenting with muscle tenderness accompanied by trigger points, "taut bands," subtle shortening and weakness of involved muscles, referred symptoms on compression or needling, and postural abnormalities, which were hypothesized as reflective of microtrauma and the generation of excessive force per muscle fiber leading to hypoxia, acidosis, and metabolic depletion. However, multiple aspects of this construct have been disproven, thus it is now controversial, particularly as it has become increasingly clear that the development of prolonged and disabling muscular pain is often linked to the presence of underlying psychosocial issues that foster inactivity and dependence on palliative modalities and pharmacologic interventions. Hence, in the absence of a clear objective anatomic abnormality to differentiate between patients with various forms of muscle pathology, they will be characterized by the descriptive diagnosis of "trigger points."

E.16.b Occupational Relationship

Work-relatedness of the condition is controversial with an absence of quality data. There is epidemiological evidence that certain cases of muscle tension syndrome may be occupational and that disorder may be related to myofascial pain. There is less controversy about work-relatedness of trigger points/myofascial pain when the disorder arises in a body part subject to a clear occupational injury. In practice, a fair number of these cases are determined to be occupational (especially if there is an inciting event, no prior history, and the pain and signs are limited to one body region and not bilateral or disseminated), although supportive epidemiological evidence may be lacking. There is no quality epidemiological evidence that tender points/fibromyalgia (or the closely related condition of chronic widespread pain) are occupational conditions (see Chronic Pain chapter).

E.16.c Specific Physical Exam Findings

Specific Physical Exam Findings may include the following:

The physical examination of a patient with trigger points is typically normal other than for muscle tenderness (and frequent evidence of depression, dysthymia or other affective disorders in fibromyalgia). Myofascial pain-related tenderness should be isolated to the body part affected

by pain and not be widespread as with fibromyalgia. It also should generally not cross the midline if there was an inciting event to one side of the body. Trigger Points/myofascial pain most commonly involves the periscapular muscles on one side of the body. This condition may be indistinguishable from "muscle tension syndrome."

Most patients have an apparent "knot" or tender point in the muscle. That tenderness is perceived as unusually tender to palpation compared with surrounding tissue, as well as compared with other patients' perceptions. Trigger points require the elicitation of distal symptoms in addition to usually being painful on palpation. The amount of palpatory force used to elicit pain complaints is unclear. The most widely used criteria have been 4kg of force, which is also the same criteria for fibromyalgia. A physical examination of a patient with muscle tenderness also requires palpating other structures that are not involved in the complaints to ascertain the distribution and character of potential tender points and trigger points. Diffuse pain complaints, while needing to be clinically addressed, may be reflective of a chronic pain syndrome and do not require a diagnostic label of myofascial pain or fibromyalgia. There may be some limitation of ROM, but in general, while active ROM to an extreme may elicit or augment the patient's pain, the final extent is usually nearly or completely normal.

E.16.d Diagnostic Testing Procedures

Diagnostic testing is generally not required for myofascial pain patients. Occasionally, testing for rheumatological disorders is indicated. This may include erythrocyte sedimentation rate, sedimentation rate, C-reactive protein, anti-rheumatoid factor, anti-nuclear antibodies, anti-Sm, anti-Ro, anti-La for rheumatoid arthritis, lupus, Sjogren's, and evaluation for mixed connective tissue disorder.

E.16.e Non-operative Treatment Procedures

Non-operative Treatment Procedures may include:

i. Procedures outlined in Section F.
Inclusion of Fear Avoidance Belief Training during the course of treatment is recommended.

A psychological evaluation is recommended as part of the evaluation and management of patients with chronic trigger points/myofascial pain to assess whether psychological factors will need to be considered and treated as part of the overall treatment plan.

ii. Medication, such as non-steroidal anti-inflammatories and analgesics would be indicated. Refer to Section F. Medications.

iii. Injections:

A) See trigger point injection therapy in section F. Injections, therapeutic

B) Glucocorticosteroids are not recommended for use in trigger point injections, as suggested by some evidence.

C) Botulinum injections are moderately not recommended for treating trigger points/myofascial pain.

iv. Benefits may be achieved through therapeutic rehabilitation.

A) Ultrasound is not recommended, as suggested by some evidence.

B) There is some evidence not recommending the use of mechanical massage devices as applied by rehabilitation service providers or massage therapists to administer massage is not recommended.

Refer to Section F, Therapeutic Procedures, Non-operative.

v. There is no evidence that activity limitations are beneficial for myofascial pain patients. It is recommended that patients be maintained at the maximal levels of activity. Ideally, no limitations. May need graded increase in activity to regain normal function if significantly debilitated. Refer to Section F, Return to Work.

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

E.16.f Surgical Indications

Surgery is not indicated.

F. Therapeutic Procedures - Non-operative

Treating providers, as well as employers and insurers are highly encouraged to reference the General Guideline Principles (Section B). 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 or restricted duty during their rehabilitation at the earliest appropriate time. Refer to "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, skilled home therapy may be necessary. Skilled home therapy may include active and passive therapeutic procedures as well as other modalities to assist in alleviating pain, swelling, and abnormal muscle tone. Skilled 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.

F.1 Acupuncture

Acupuncture is an accepted and widely used procedure for the relief of pain and inflammation, and there is some scientific evidence to support its use. The exact mode of action is only partially understood. Western medicine literature suggests 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 to functional activity. Acupuncture should be performed by licensed practitioners.

F.1.a Acupuncture without Electrical Stimulation

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.

F.1.b Acupuncture with Electrical Stimulation

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.

F.1.c Time Frames For Acupuncture with/without Electrical Stimulation

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.

F.1.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.

F.2 Biofeedback

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, auditorily, 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 positive symptomatic or functional gains.

F.3 Extracorporeal Shockwave Therapy (ESWT)

Extracorporeal Shockwave Therapy (ESWT) is used to increase function and decrease pain in patients with specified types of calcifying tendonitis who have failed conservative therapy. It is not a first line therapy. ESWT uses acoustic impulses with duration in microseconds focused on the target tissue. The mechanism of action is not known, but is not likely to be simply the mechanical disintegration of the calcium deposit. High-energy application of ESWT may be painful, and rare complications such as osteonecrosis of the humeral head have been reported. Dosage is established according to patient tolerance. Higher dosages are generally associated with better functional results. There is good evidence that ESWT may improve pain and function in radiographically or sonographically defined Type I or Type II calcium deposits when conservative treatment has failed to result in adequate functional improvement, but optimal

dosing has not been defined. In the absence of a documented calcium deposit, there is no evidence that ESWT is effective and its use in this setting is not recommended. Neither anesthesia nor conscious sedation is required nor is it recommended for this procedure. There is no evidence that results with fluoroscopic guidance or with computer-assisted navigation are superior to results obtained by palpation. These are not recommended.

Indications - patients with calcifying tendonitis who have not achieved functional goals after 2 to 3 months of active therapy. The calcium deposits must be Type I, homogenous calcification with well-defined borders or Type II, heterogeneous with sharp border or homogenous with no defined border.

- Time to Produce Effect: 3 days.
- Frequency: Every 4 to 7 days.
- Optimum Duration: 2 sessions. Progress can be documented by functional reports and/or x-ray or sonographic decrease in calcium.
- Maximum Duration: 4 sessions.

F.4 Therapeutic Injections

Description - Therapeutic injection procedures are generally accepted, well-established procedures that may play a significant role in the treatment of patients with upper 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 Specific Diagnosis, Testing and Treatment Procedures.

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

F.4.a Shoulder Joint Injections

Shoulder Joint Injections are generally accepted, well-established procedures that can be performed as analgesic or anti-inflammatory procedures. Common shoulder joint injections include anterior and posterior glenohumeral and acromioclavicular.

- Time to Produce Effect: Immediate with local anesthesia, or within 3 days if no anesthesia.
- Optimum Duration: Usually 1 or 2 injections are adequate.
- Maximum Duration: Not more than 3 to 4 times annually.

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

F.4.b Subacromial Injections

Subacromial Injections There is good evidence that blinded subacromial blocks are not accurate. Up to a third of blinded injections may involve the cuff and are likely to cause pain. This may lead to an incorrect diagnosis when the injection is being used diagnostically. (Refer to Diagnostic injections, F.4.b.) If there is a concern regarding needle placement, sonography or fluoroscopy may be used.

F.4.c Soft Tissue Injections

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.

Steroid injections should be used cautiously in diabetic patients. Diabetic patients should be reminded to check their blood glucose level at least daily for 2 weeks post injections.
The risk of tendon rupture should be discussed with the patient and the need for restricted duty emphasized.

- Frequency: Usually 1 or 2 injections are adequate.
- Time to Produce Effect: Immediate with local anesthesia, or within 3 days if no anesthesia.
- Optimum/Maximum Duration: 3 steroid injections at the same site per year.

F.4.d Trigger Point Injections

Trigger Point Injections although generally accepted, are not routinely used in the shoulder. However, it is not unusual to find shoulder girdle myofascial trigger points associated with shoulder pathology which may require injections.

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, pneumothorax, anaphylaxis, neurapraxia, and neuropathy. If corticosteroids are injected in addition to local anesthetic, there is a risk of local developing 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.

F.4.e Prolotherapy

Prolotherapy (also known as Sclerotherapy/Regenerative Injection Therapy) consists of peri- or intra-ligamentous 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 upper extremity injuries

F.4.f Viscosupplementation/Intracapsular Acid Salts

Viscosupplementation/Intracapsular Acid Salts involves the injection of hyaluronic acid and its derivatives into the glenohumeral joint space. Hyaluronic acid is secreted into the joint space by the healthy synovium and has functions of lubrication and cartilage protection. Its use in the shoulder is not supported by scientific evidence at this time.

F.5 Jobsite Alteration

Early evaluation and training of body mechanics are essential for every injured worker. Risk factors to be addressed include repetitive overhead work, lifting and/or tool use. In some cases, this requires a jobsite evaluation. Some evidence supports alteration of the work site in the early treatment of shoulder injuries. There is no single factor or combination of factors that is proven to prevent or ameliorate shoulder 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 overhead work, and awkward overhead positions requiring use of force, upper extremity vibration, and contact pressure on the nerve. 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 ergonomist or other professional familiar with work place evaluation. 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.

Ergonomic Changes: may be made to modify the hazards identified. In addition, workers should be counseled to vary tasks throughout the day whenever possible. OSHA suggests that workers' who perform overhead repetitive tasks with or without force, take 15 to 30 second breaks every 10 to 20 minutes, or 5-minute breaks every hour. Mini-breaks should include stretching exercises.

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).

F.6 Medications

Medications for the treatment of upper extremity injuries is appropriate to control acute pain and inflammation. Use of medications will vary widely due to the spectrum of injuries from simple strains to complicated fractures. All drugs should be used according to patient needs. 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 may be beneficial for pain management in some patients with upper extremity injuries. This includes topical capsaicin, nonsteroidal, as well as, topical iontophoretics/phonophoretics, such as steroid creams and lidocaine.

The following are listed in alphabetical order.

F.6.a Acetaminophen

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.

- Optimum 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.

F.6.b Bisphosphonates

Bisphosphonates are recommended to treat osteonecrosis. Bisphosphonates have been evaluated in one quality study of the hip, thus bisphosphonates are recommended for shoulder osteonecrosis treatment.

F.6.c Minor Tranquilizer/Muscle Relaxants

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.

- Optimum Duration: Up to 1 week.
- Maximum Duration: 4 weeks.

F.6.d Narcotics

Narcotics should be primarily reserved for the treatment of severe upper extremity pain. There are circumstances where prolonged use of narcotics is justified based upon specific diagnosis and in pre- and post–operative patients. In these and other cases, it should be documented and justified. In mild-to-moderate cases of upper 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 should be documented and justified based on the diagnosis and/or invasive procedures.

- Optimum Duration: Up to 10 days.
- Maximum Duration: 2 weeks for most non-operative cases. Use beyond two weeks is acceptable in appropriate cases. Refer to Chronic Pain Guidelines which provides a detailed discussion regarding medication use in chronic pain management.

F.6.e Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)

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 advises 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, sucraflate 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.

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

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 an 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.

F.6.f Oral Steroids

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 avascular necrosis, hypertension, diabetes, glaucoma, peptic ulcer disease, etc., which should be discussed with the patient.

- Optimal Duration: 3 to 7 days.
- Maximum Duration: 7 days.

F.6.g Psychotropic/Anti-anxiety/Hypnotic Agents

Psychotropic/Anti-anxiety/Hypnotic Agents may be useful for treatment of mild and chronic pain, dysesthesia, sleep disorders, and depression. 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.

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

F.6.h Tramadol

Tramadol is useful in relief of upper 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 inhibiters, 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.

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

F.6.i Topical Drug Delivery

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 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.

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 nonexistent, 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 effective than oral medications. Therefore, they should not generally be used unless the patient has an intolerance to anti-inflammatories.

- Optimum Duration: One week.
- Maximum Duration: 2 weeks per episode.

ii. **Capsaicin**: is another medication option for topical drug use in upper 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.

- Optimum Duration: One week.
- Maximum Duration: 2 weeks per episode.

iii. **Other Agents**: Other topical agents, including prescription drugs (i.e., lidocaine), prescription compound agents, and prescribed over-the-counter medications (i.e., blue ice), may be useful for pain and inflammation. These drugs should be used according to patient needs.

- Optimum Duration: Varies with drug or compound.
- Maximum Duration: Varies with drug or compound.

iv. **Iontophoretic Agents**: Refer to Iontophoresis, in F.14, under Passive Therapy of this section.

F7. Occupational Rehabilitation Programs

F.7.a 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. These programs are frequently necessary for patients who must return to physically demanding job duties or whose injury requires prolonged rehabilitation and therapy spanning several months.

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.

Work Simulation:
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.

F.7.b 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 perceived disability, dysfunction, de-conditioning and psychological involvement. For patients with chronic pain, refer to the Department's Chronic Pain Disorder Medical Treatment Guidelines.

Work Hardening:
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, or vocational specialist or Certified Biofeedback Therapist.

- Length of visit: Up to 8 hours/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.

F8. Orthotics and Prosthetics

F.8.a Fabrication/Modification of Orthotics

Fabrication/Modification of Orthotics 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. For specific types of orthotics/prosthetics, refer to Section E. Specific Diagnosis, Testing and Treatment Procedures.

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

F.8.b Orthotic/Prosthetic Training

Orthotic/Prosthetic Training is the skilled instruction (preferably 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 activities of daily living and self-care techniques.

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

F.8.c Splints or Adaptive Equipment

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, computer interface or seating, 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.

F.9 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.

F.10 Personality/Psychological/Psychosocial Intervention

Psychosocial treatment is 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 evaluation or diagnostic workup should clarify and distinguish between pre-existing psychological conditions versus aggravated psychological conditions versus

psychological conditions caused by occupational injury or disease. 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 Department'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. If further counseling beyond 3 months is indicated, the authorized treating provider must document every 4 to 6 weeks during treatment what treatment is for pre-existing psychological conditions versus aggravated psychological conditions versus psychological conditions caused by occupational injury or disease, as well as project a realistic functional prognosis.

F.11 Restriction of Activities

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 shoulder. 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 upper extremity injuries.

F.12 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 Department recommends the following:

F.12.a 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 non-surgical cases 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. Refer to Specific Diagnoses in Section E. and Post-operative Return to Work Subsections.

F.12.b 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 is the employer's responsibility to determine if temporary duties can be provided within the restrictions. For shoulder injuries, the following should be addressed when describing the patient's activity level:

1. Activities such as overhead motion, lifting, abduction;
2. Static shoulder positions with regard to duration and frequency;
3. Use of adaptive devices or equipment for proper ergonomics and to enhance capacities;
4. Maximum lifting limits with reference to the frequency of the lifting and/or the object height level; and
5. Maximum limits for pushing, pulling, with limits on bending and twisting at the waist as necessary.

F.12.c 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 "Special Tests" of this section.

F.13 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. Frequency times and duration of treatment apply only to diagnoses not previously covered in Section E.

The following active therapies are listed in alphabetical order:

F.13.a Activities of Daily Living (ADL)

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.

F.13.b Aquatic Therapy

Aquatic Therapy is a well-accepted treatment which consists of the therapeutic use of aquatic immersion for therapeutic exercise to promote ROM, flexibility, strengthening, core stabilization, endurance, 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. Literature has 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:

- Postoperative therapy as ordered by the surgeon;
- Intolerance for active land-based or full-weight bearing therapeutic procedures;

- Symptoms that are exacerbated in a dry environment; and/or
- 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.

F.13.c Functional Activities

Functional Activities are well-established interventions which involve 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.

F.13.d Functional Electrical Stimulation

Functional Electrical Stimulation is an accepted treatment in which the application of electrical current to elicit involuntary or assisted contractions of atrophied and/or impaired muscles. Indications include muscle atrophy, weakness, and sluggish muscle contraction secondary to pain, injury, 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 functional gains are documented by a therapist, a home unit may be provided.

F.13.e Neuromuscular Re-education

Neuromuscular Re-education is a generally accepted treatment. It 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 to 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.

F.13.f Therapeutic Exercise

Therapeutic Exercise is a generally well-accepted treatment. Therapeutic exercise, with or without mechanical assistance or resistance, may include isoinertial, isotonic, isometric and isokinetic types of exercises. The exact type of program and length of therapy should be determined by the treating physician with the physical or occupational therapist. Refer to Section E., regarding specific diagnoses for details. In most cases, the therapist instructs the patient in a supervised clinic and home program to increase motion and subsequently increase strength. Usually, isometrics are performed initially, progressing to isotonic exercises as tolerated.

- Time to Produce Effect: 2 to 6 treatments.
- Frequency: 2 to 3 times per week.
- Optimum Duration: 16 to 24 sessions.
- Maximum Duration: 36 sessions. 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.

F.14 Therapy - Passive

Most of the following passive therapies and modalities are generally 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 used 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" have 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.

F.14.a Continuous Passive Movement (CPM)

Refer to Rotator Cuff Tear, Section E.

F.14.b Electrical Stimulation (Unattended)

Electrical Stimulation (Unattended) is an accepted treatment. Unattended electrical stimulation 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 frequent use.
- Optimum Duration: 1 to 3 months.
- Maximum Duration: 3 months.

F.14.c Hyperbaric Oxygen Therapy

Hyperbaric Oxygen Therapy: There is no evidence to support long-term benefit of hyperbaric oxygen therapy for non-union upper extremity fractures. It is not recommended.

F.14.d Immobilization

Immobilization: Time is dependent upon type of injury.

- Time to Produce Effect: One day.

- Frequency: Once.
- Optimum Duration: One week.
- Maximum Duration: 12 weeks.

The arm may be immobilized in a sling for 1 to 12 weeks post-injury, depending upon the age of the patient and diagnosis. The patient is instructed in isometric exercises while in the sling for the internal and external rotators and the deltoid.

F.14.e Iontophoresis

Iontophoresis is an accepted treatment which consists of 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 (mecholyl, hyaluronidase, salicylate), ischemia (magnesium, mecholyl, iodine), muscle spasm (magnesium, calcium), calcifying 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.

F.14.f Manipulation

Manipulation is a generally accepted, well-established and widely used therapeutic intervention for shoulder 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.

F.14.g Manual Electrical Stimulation

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.

F.14.h Massage - Manual or Mechanical

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 practitioner's hands. Indications include edema (peripheral or hard and non-pliable edema), muscle spasm, adhesions, the need to improve peripheral circulation and ROM, 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.

F.14.i Mobilization (Joint)

Mobilization (Joint): is a generally well-accepted treatment. Mobilization is passive movement which may include passive ROM 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/maltraction.

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

F.14.j Mobilization (Soft Tissue)

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.

F.14.k Superficial Heat and Cold Therapy

Superficial Heat and Cold Therapy is a generally accepted treatment. 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. 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.

F.14.l Transcutaneous Electrical Nerve Stimulation (TENS)

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.

F.14.m Ultrasound (including Phonophoresis)

Ultrasound (including Phonophoresis) is an accepted treatment. Ultrasound 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, and 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.

F.15 Vocational Rehabilitation

Vocational Rehabilitation is a generally accepted intervention. Initiation of vocational rehabilitation requires adequate evaluation of patients for quantification of highest functional level, motivation and achievement of maximum medical improvement. Vocational rehabilitation may be as simple as returning to the original job or as complicated as being retrained for a new occupation.

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 operative conditions (e.g., peripheral neuropathy, myofascial pain, scleratogenous or sympathetically mediated pain syndromes, psychological), 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 neuro-musculoskeletal examination to identify mechanical pain generators that may respond to non-surgical techniques or may be refractory to surgical intervention.

Structured rehabilitation interventions should be strongly considered post-operative in any patient not making expected functional progress within three weeks post-operative.
Post-operative therapy will frequently require a repeat of the therapy provided pre-operatively. Refer to Section F., Therapeutic Procedures, Non-operative, and consider the first post-operative visit as visit number one, for the time frame parameters provided.

Return-to-work restrictions should be specific according to the recommendation in Section F.12, Therapeutic Procedures – Non-operative.

G.1 Shoulder Replacement (Arthroplasty)

Description/Definition:
Prosthetic replacement of the articulating surfaces of the shoulder joint. There are three types of procedures commonly performed. 1) The total shoulder component in which the glenoid and humeral head are replaced anatomically. 2) The hemiarthroplasty which involves replacement of the humeral head only. 3) The reverse arthroplasty where the head of the humerus is replaced by a prosthesis forming a socket and the glenoid is replaced with a ball prosthesis.

Occupational Relationship:
Usually from post-traumatic arthritis, or from trauma resulting in severe humeral head fractures.

Specific Physical Exam Findings:
Stiff, painful shoulder with limited function.

Diagnostic Testing Procedures:
Radiographs or CTs demonstrating humeral head fracture. CTs or diagnostic arthroscopy to explore the status of rotator cuff and associated muscles and tendons, the presence of arthritis or subluxation, or superior migration of the humeral head. For revision procedures, a non-MRI arthrography or sonogram may be important to better visualize associated pathology.

Surgical Indications:

The decision of whether a patient receives a total arthroplasty or a hemiarthroplasty depends on the surgeon's discretion. Factors to consider are the presence of glenoid erosions, humeral head subluxation and rotator cuff strength. There is good evidence that total arthroplasties compared to hemi-arthroplasties results in improved function in primary osteoarthritis of the shoulder, and relief of pain two years post-operatively. Longer-term results are unknown.

i. Hemiarthroplasty may utilize a long stem humeral head replacement or a resurfacing device. It may also be performed for humeral head fractures. It has been used for severe arthritis unresponsive to other treatments; however, there is some evidence that total shoulder arthroplasty may yield a better functional outcome. In younger active patients the eventual wear on the glenoid cartilage may cause decreased function over time. Total arthroplasty may therefore be preferred in many cases.

Partial humeral head prosthesis may be useful in some cases. Cementless surface humeral head replacement may be indicated in young patients with glenohumeral arthritis and retained glenoid cartilage.

ii. Total shoulder arthroplasty is usually performed in cases of severe arthritis when all reasonable conservative measures have been exhausted without sufficient return to activities of daily living. Arthroscopic surgery may be considered in selected patients with a milder degree of arthritis. Arthroscopic SLAP repair is usually not recommended in cases of severe arthritis. The rotator cuff should generally be intact or repairable.

iii. Reverse arthroplasty is generally considered a salvage procedure for patients over 70 with severe osteoarthritis, massive rotator cuff tears and pseudo paralysis with integrity of the deltoid. Complications rates may be in the vicinity of 10% of patients within the first year following surgery. The long-term success of the prosthesis is not known at this time.

Reverse prosthesis may also be the treatment for failed hemiarthroplasty with extensive cuff tears and/or instability. Most literature confirms that the complication rate is higher and the success rate lower when reverse arthroplasty is performed on a previously operated joint, however, many patients demonstrate good improvement with elevation, but not necessarily rotation. Bone loss may increase the complication rate.

iv. Procedural complications may include humeral head subluxation or dislocation, humeral and/or glenoid loosening, rotator cuff tear, fractures, stiffness, painful glenoid erosion, transient nerve palsies, heterotopic ossification, bone loss, and component mal-positioning.

v. Revision surgery may be performed by an orthopedic surgeon in cases with chronic pain and stiffness, painful glenoid erosion, or difficulty with activities of daily living. Prior authorization is required and a second opinion by a surgeon with special expertise in shoulder surgery should usually be performed. In the case of a total failure of the prosthesis, arthrodesis is the salvage procedure.

Operative Treatment:
Prosthetic replacement of the articular surfaces of the shoulder.

Post-operative Treatment:
i. Individualized rehabilitation program based on communication between the surgeon and the therapist. Timing of passive motion and active rehabilitation is dependent on the type of procedures performed.

- Pool exercise initially under therapists or surgeon's direction then progressed to independent pool program.
- Progression to a home exercise is essential. Therapy should continue for at least 10 weeks with transition to home exercises at the beginning of each new phase of therapy.
- Gradual resistive exercise from 3 to 12 months, with gradual return to full activity at 6 to 12 months.
    - Time frames for therapy (excluding pool therapy).
    - Optimum: 12 to 24 sessions.
    - Maximum: 36 sessions. If functional gains are being achieved additional visits may be authorized for the patient to achieve their functional goal.

ii. Reverse arthroplasty patients may have a more rapid rehabilitation in some cases. Per the recommendation of the surgeon the following therapies may take place: Sling use for the first 3 weeks, ADLs at 3 to 6 weeks, and then gentle strengthening.

iii. Should progress plateau the provider should reevaluate the patient's condition and make appropriate adjustments to the treatment plan. Other therapies may be employed in individual cases.

iv. Gradual return to full activity can occur between 6 to 12 months, depending on the procedure.

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

G.2 OATS Procedure

Osteoarticular allograft transplantation is a procedure which places a plug of cadaveric bone tissue into a chondral defect at the articular surface of an injured bone. Its use has been described in case reports in the treatment of recurrent shoulder instability when large humeral head defects (Hill-Sachs lesions) are thought to be responsible for repeated episodes of subluxation. At this time, there is limited information concerning its effectiveness and appropriate application. For this reason, it requires prior authorization as an isolated procedure with a second opinion by a surgeon with special expertise in shoulder surgery. The procedure may be used for isolated chondral/bony deficits involving the humeral head, including avascular necrosis. Partial humeral head prosthesis may be useful in some cases. (Refer to Hemi-arthroplasty section, G.1.)

G.3 Arthrodesis

Description/Definition:
Fusion of the shoulder. Used as a salvage procedure.

Occupational Relationship:
Secondary to severe trauma and failure of other procedures.

Specific Physical Exam Findings:
Shoulder function is minimal and is usually associated with severe rotator cuff pathology.

Diagnostic Testing Procedures:
See Specific Diagnostic sections.

Surgical Indications:
Inability to perform activities of daily living, failed previous procedures.

Operative Treatment:
Fusion.

Post-operative Treatment:
An individualized rehabilitation program based upon communication between the surgeon and the therapist. Therapy may begin 6 weeks to 3 months depending on recovery. Occupational therapy is critical to improve function in activities of daily living. Assistive devices may be necessary.

- Time frames for therapy (excluding pool therapy).
- Optimum: 12 to 24 sessions.
- Maximum: 36 sessions. If functional gains are being achieved additional visits may be authorized for the patient to achieve their functional goal.

G.4 Manipulation Under Anesthesia

Refer to Section E. Adhesive Capsulitis/Frozen Shoulder Disorder

G.5 Hardware Removal

Description/Definition:
Surgical removal of internal or external fixation device, commonly related to fracture repairs.

Occupational Relationship:
Following healing of a post-traumatic injury that required fixation or reconstruction using instrumentation.

Specific Physical Exam Findings:

Local pain to palpation, swelling, erythema.

Diagnostic Testing Procedures:
Radiographs, tomography, CT scan, MRI.

Non-operative Treatment:
Active and/or passive therapy for local modalities, activity modification. Nonsteroidal Anti-Inflammatory Drugs (NSAIDs).

Surgical Indications:
Persistent local pain, irritation around hardware.

Operative Treatment:
Removal of instrumentation may be accompanied by scar release/resection, capsular release, and/or manipulation. Some instrumentation may be removed in the course of standard treatment without local irritation.

Post-operative Treatment:
Include an individualized rehabilitation program based upon communication between the surgeon and the therapist.

Early rehabilitation interventions are recommended to maintain range-of-motion and progressive strengthening.

- Frequency – 3 to 5 times per week for the first 2 weeks, 3 times per week for the following 2 weeks, then 1 to 2 times per week.
- Optimum Duration for 6 to 8 weeks with progression to home exercise and or pool therapy.
- Maximum Duration – 12 weeks. Occasional follow-up visits may be justified to reinforce exercise patterns, or to reach final functional goals if the therapy to date has demonstrated objective functional gains.

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

G.6 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. In the treatment of non-union of fractures of the humerus and clavicle, no controlled clinical trials have been conducted as of this date, though small case series have resulted in union of some fractures. Ectopic ossification into adjacent muscle has been reported to restrict motion in periarticular fractures. Due to lack of information on the incidence of complications and overall success rate, its use requires prior authorization. It

should be used principally for non-union of fractures that have not healed with conventional surgical management or peri-prosthetic fractures.