RULE 17, EXHIBIT 4

Shoulder Injury
Medical Treatment Guidelines
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DIVISION OF WORKERS' COMPENSATION

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DEPARTMENT OF LABOR AND EMPLOYMENT

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SHOULDER INJURY MEDICAL TREATMENT GUIDELINES

A.   INTRODUCTION

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

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

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

B. GENERAL GUIDELINES PRINCIPLES

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

1. **APPLICATION OF GUIDELINES** The Division provides procedures to implement medical treatment guidelines and to foster communication to resolve disputes among the provider, payer, and patient through the Workers' Compensation Rules of Procedure. In lieu of more costly litigation, parties may wish to seek administrative dispute resolution services through the Division or the Office of Administrative Courts.

2. **EDUCATION:** 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 chronic pain and disability. Currently, practitioners often think of education last, after medications, manual therapy, and surgery. Practitioners must implement strategies to educate patients, employers, insurance systems, policy makers, and the community as a whole. An education-based paradigm should always start with inexpensive communication providing reassuring and evidence-based information to the patient. More in-depth patient education is currently a component of treatment regimens which employ functional, restorative, preventive, and rehabilitative programs. No treatment plan is complete without addressing issues of individual and/or group patient education as a means of facilitating self-management of symptoms and prevention.

3. **INFORMED DECISION MAKING**: Providers should implement informed decision making as a crucial element of a successful treatment plan. Patients, with the assistance of their health care practitioner, should identify their personal and professional functional goals of treatment at the first visit. Progress towards the individual's identified functional goals should be addressed by all members of the health care team at subsequent visits and throughout the established treatment plan. Nurse case managers, physical therapists, and other members of the health care team play an integral role in informed decision making and achievement of functional goals. Patient education and informed decision making should facilitate self-management of symptoms and prevention of further injury.

4. **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.

5. **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.

6. **ACTIVE THERAPEUTIC EXERCISE PROGRAM** goals should incorporate patient strength, endurance, flexibility, coordination, and education. This includes functional application in vocational or community settings.

7. **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.

8. **RE-EVALUATE TREATMENT EVERY 3 TO 4 WEEKS** If a given treatment or modality is not producing positive results within three to four weeks, the treatment should be either modified or discontinued. Before discontinuing the treatment, the provider should have a detailed discussion with the patient to determine the reason for failure to produce positive results. Reconsideration of diagnosis should also occur in the event of a poor response to a seemingly rational intervention.

9. **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.

10. **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.

11. **RETURN-TO-WORK** is therapeutic, assuming the work is not likely to aggravate the basic problem or increase long-term pain. The practitioner must provide specific physical limitations and the patient should never be released to non-specific and vague descriptions such as "sedentary" or "light duty." The following physical limitations should be considered and modified as recommended: lifting, pushing, pulling, crouching, walking, using stairs, bending at the waist, awkward and/or sustained postures, tolerance for sitting or standing, hot and cold environments, data entry and other repetitive motion tasks, sustained grip, tool usage and vibration factors. Even if there is residual chronic pain, return-to-work is not necessarily contraindicated.

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

12. **DELAYED RECOVERY** Strongly consider a psychological evaluation, if not previously provided, as well as initiating interdisciplinary rehabilitation treatment and vocational goal setting, for those patients who are failing to make expected progress 6 to 12 weeks after an injury. The Division recognizes that 3 to 10% of all industrially injured patients will not recover within the timelines outlined in this document, despite optimal care. Such

individuals may require treatments beyond those 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.

13. **GUIDELINE RECOMMENDATIONS AND INCLUSION OF MEDICAL EVIDENCE** *All recommendations are based on available evidence and/or consensus judgment*. When possible, guideline recommendations will note the level of evidence supporting the treatment recommendation. It is generally recognized that early reports of a positive treatment effect are frequently weakened or overturned by subsequent research. When interpreting medical evidence statements in the guideline, the following apply:

- Consensus means the judgment 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 evidence" means the recommendation considered at least one adequate scientific study, which reported that a treatment was effective. The Division recognizes that further research is likely to have an impact on the intervention's effect.

- "Good evidence" 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. The Division recognizes that further research may have an impact on the intervention's effect.

- "Strong evidence" 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. The Division recognizes that further research is unlikely to have an important impact on the intervention's effect.

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

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

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

C. INITIAL DIAGNOSTIC PROCEDURES

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

Shoulder pain can be difficult to diagnose for many reasons, such as:1) there may be more than one lesion present; 2) neurological pathology may appear similar to musculoskeletal pathology; and 3) the variety of shoulder movements within a confined joint space complicates diagnosis.

1. <u>**HISTORY TAKING AND PHYSICAL EXAMINATION (HX & PE)**</u> are generally accepted, well-established and widely used procedures that establish the foundation/basis for and dictates subsequent stages of diagnostic and therapeutic procedures. When findings of clinical evaluations and those of other diagnostic procedures are not complementing each other, the objective clinical findings should have preference. The medical records should reasonably document the following:

   a. <u>**History of Present Injury**</u>:

      i. <u>Nature of pain</u> – type, level, and timing – The following describe different types of pain:

         • Bone: constant, localized

         • Nerve: hot, burning, radiating

         • Capsular/ligamentous: achy

         • Muscular: pain aggravated by movement

         • Vascular: throbbing

         • Cartilaginous: clicking and/or pain with range of motion.

      ii. Chief complaints: pain instability, weakness, or loss of motion;

      iii. Mechanism of injury. This includes details of symptom onset and progression, and documentation of right or left dominance. For traumatic injuries, clearly document the position of the arm and the direction of the force;

      iv. <u>Functional Assessment</u>: Functional ability should be assessed and documented at the beginning of treatment. Periodic assessment should be recorded throughout the course of care to follow the trajectory of recovery. In addition to being more relevant to recovery from shoulder pain, functional measures are likely to be more reliable over time than

pain measures.

Patient-reported outcomes, whether of pain or function, are susceptible to a phenomenon called response shift. This refers to changes in self-evaluation which may accompany changes in health status. Patient self-reports may not coincide with objective measures of outcome, such as Disability of Arm, Shoulder and Hand (DASH), due to reconceptualization of the impact of pain on daily function and internal recalibration of pain scales (Schwartz, 2009). Response shift may obscure treatment effects in clinical trials and clinical practice, and may lead to apparent discrepancies in patient-reported outcomes following treatment interventions. While methods of measuring and accounting for response shift are not yet fully developed, understanding that the phenomenon exists can help clinicians understand what is happening when some measures of patient progress appear inconsistent with other measures of progress.

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

vi.   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 is common with a labral tear. Pain radiating below the elbow, may indicate cervical radiculopathy or proximal entrapment neuropathy. In some cases of cervical disc pathology, shoulder pain may not radiate below the elbow;

vii.   Age may affect the likely diagnosis;

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

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

b.   Past History:

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

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

iii.   Smoking history;

iv.   Vocational pursuits recreational pursuits, including military service, and other avocational activities; and

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

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:

i. Visual inspection; findings such as scapular winging, presence and distribution of atrophy, posture and other asymmetry of upper extremities;

ii. Palpation, including the acromio-clavicular (AC) joint, sternoclavicular joint, biceps tendons, and the subacromial bursa in the region of the acromiohumeral sulcus;

iii. Range-of-motion/quality of motion; all ranges of motion should be compared to the opposite side;

iv. Strength, shoulder girdle weakness may indicate musculoskeletal or neurogenic pathology;

v. Joint stability;

vi. Integrity of distal circulation and limited neurologic exam;

vii. Cervical spine evaluation; and

viii. If applicable, full neurological exam such as: dermotomes, myotomes, reflexes, muscle atrophy, gait abnormality, and signs of myelopathy.

ix. **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. In addition, 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) Acromioclavicular Joint Tests

1) Crossed Arm Adduction – Examiner adducts arm across the body as far as possible toward the opposite shoulder. Pain in the AC joint suggests AC joint pathology or impingement.

2) Cross-body adduction may be limited when the posterior capsule is tight. To test for this, the examiner stands behind the seated patient and brings the arm across the chest as far as is comfortable for the patient. The distance between the antecubital fossa of the adducted arm and the acromion of the opposite shoulder is measured and recorded. The test is repeated with the other arm and shoulder. Posterior capsule tightness, which limits cross-body adduction, will increase the distance between the adducted antecubital fossa and the opposite acromion.

3) 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 pressing the clavicle and the acromion together. If the patient reports increased pain in the AC joint, the test suggests AC joint pathology. The examiner must use the pads of the fingers rather than the bony part of the hand to perform the test.

4) Tenderness with palpation directly over the AC joint is an essential finding for identifying AC joint pathology.

B) Bicipital Tendon Disorders

1) 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 superior labral tear from anterior to posterior (SLAP) lesion in young patients (Hegedus, 2008).

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. The examiner provides resistance to forward flexion. If pain is produced with resistance, the test suggests biceps tendon instability or tendinitis.

4) 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.

C) Glenohumeral Instability/Labral Tears

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) 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.

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) 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:

- Grade 0, little or no movement;

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

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

4) 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.

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. This test may also cause pain with impingement syndrome.

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

D) Impingement and other rotator cuff pathology tests:

1) Arc Of Pain – Pain with 60 to 120 degrees of abduction. Positive for subacromial or rotator cuff disorders: may be positive for Supraspinatus tear or impingement.

2) Hawkins - arm is abducted to 90 degrees, forward flexed by 90 degrees with elbow flexed. Examiner internally rotates the humerus. Pain suggests impingement. May also be performed followed by internal rotation and elevation. Reproduction of pain constitutes a positive test.

3) Impingement Sign – Patient extends shoulder, then abducts and reports any pain.

4) Neer Impingement Sign – Examiner passively flexes internally rotated arm anteriorly with elbow fully extended to reproduce impingement. Positive if pain is reproduced.

5) 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.

E) 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. Additional tests for SLAP (superior labral tear from anterior to posterior are found under SLAP Lesions).

F) Rotator cuff tear

Most published clinical examination studies assess rotator cuff pathology. Tests may be reliable for ruling out diagnoses, but not necessarily for defining the pathology accurately.

1) Arc Of Pain – Pain with 60 to 120 degrees of abduction. Positive for subacromial or rotator cuff disorders: may be positive for Supraspinatus tear or impingement.

2) Belly Lift off test - The arm is passively flexed to 90 degrees with elbow flexed to 90 degrees and the elbow supported by the examiner. The palm of the hand is placed on the abdomen. The patient must then maintain the hand on the abdomen after the examiner releases the patient's hand but continues to support the elbow. If the patient cannot maintain the hand in position against the abdomen, the test is positive. This test indicates possible tear to the subscapularis.

3) 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. However, the test is also positive with pain inhibition.

4) 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, tendinitis or tendonosis.

5) External Rotation Lag Test - the patient's arm is passively abducted to 20 degrees with elbow flexed at 90 degrees, and almost fully externally rotated. If the patient cannot actively maintain the arm in external rotation, this suggests a supraspinatus and/or infraspinatus tear.

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

7) Lift Off Test - the dorsal aspect of the 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) Weakness with abduction.

G) Superior-Labral from Anterior to Posterior (SLAP) Lesions

1) 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 and internal impingement or biceps instability.

2) 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.

x. 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, such as DASH. 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;

- Perform personal hygiene such as ability to wipe perineal area with the affected arm;

- Ability to do the household shopping alone;

- Ability to shower or bathe 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;

- Ability to enter/exit automobile including operation of steering mechanism, seat belt, and gear selector.

- Difficulty with any other activities including sports and work duties;

- Concerns about putting on overhead clothing;

- Fear of dislocation, or concerns that a specific activity might cause the shoulder to "go out";

A detailed description of ability to perform job duties. A positive historical information should be validated by the provider's physical exam.

Valid functional shoulder tests are valuable for case management. It is suggested that providers follow patients' functional status throughout the claim with tools such as the Constant-Murley, DASH, Simple Shoulder Test, Patient Specific Functional Scale, Shoulder Pain and Disability Index (SPADI).

2. **RELATIONSHIP TO WORK AND OTHER ACTIVITY:** This includes a statement of the probability that the illness or injury is medically work-related. If further information is necessary to determine work relatedness, the physician should clearly state what additional diagnostic studies or job information is required.

Principles of Causation of Occupational Shoulder Diagnoses

Causation is a medical/legal analysis in the workers compensation system. The

information in the Medical Treatment Guidelines pertaining to causation addresses only the evidence related to the medical analysis of causation. Actual cases may vary from the evidence presented based on specific circumstances of the claim. Work-related conditions may occur from the following:

- a specific incident or injury,

- aggravation of a previous symptomatic condition, **or**

- a work-related exposure that renders a previously asymptomatic condition symptomatic and subsequently requires treatment.

All of these conditions must be determined based on the specifics of the work related injury or exposure. The clinician determines the need for treatment due to the work related event. Most occupational shoulder cases result from injuries. However there are some studies looking at shoulder diagnoses from a cumulative occupational exposure viewpoint.

The studies reviewed were chosen because they identified shoulder conditions as chronic or causing disability. The complaint of pain alone is generally not compensable in this system. To apply the below standards, the clinician must first make a specific shoulder diagnosis which is substantiated by consistent physical exam findings. The following information was reviewed using evidence-based standards to address the effects on workers of cumulative exposures and should only be considered in that context. The clinician should use this information judiciously.

Cumulative work-related causation for shoulder disorders is difficult to quantify given 1) the variable techniques used to measure work exposures and the paucity of studies which have measured exposures, 2) the lack of verified clinical exams and 3) the lack of prospective studies. Given this difficulty, this section of the guidelines will summarize not only those studies which qualify for at least some evidence given our study criteria but also studies of lower levels which have similar findings in order to assure that the final recommendations are the best reflection of current literature.

Several studies reported on shoulder pain alone based on self-report of both pain and work related activities. They do not meet our criteria for evidence but are interesting to consider in relationship to the evidence studies. One prospective study of 598 workers in repetitive jobs found that men who reported shoulder pain 3 years after the initial questionnaire were more statistically likely to report repetitive use of a tool, while women were statically more likely to report use of a vibrating tool and frequent bending forward and/or arm above shoulder activities (LeClerc, 2004). A separate two year prospective study of new onset shoulder pain in newly hired employees found the following related factors in a multi-variate analysis: working with hands above the head >15minutes/day; pushing and pulling >= 70 lbs; and lifting with one or two hands >22 lbs (Harkness, 2003).

These studies could considerably distort the actual work related task limits for the shoulder diagnoses as discussed in this guideline as no physical exams were performed and all work estimates were self-reported. Another study matching self-reported work

activities with actual observed activities found that trunk flexion, neck flexion and hand above shoulder activities were significantly overestimated by workers (Viikari-Juntura, 1996).

A prospective population based Finnish study followed a sample of 1286 workers 20 years after an initial study. 883 workers who had no shoulder disorder at baseline completed a standard clinical exam by physicians blinded to their work status. Work factors were obtained through self-report of current or longest occupational exposure. Four work factors increased the risk for physical exam findings: lifting heavy loads, vibration, repetition, and awkward postures. The actual length of time with exposure to these tasks is unknown but thought to reflect the workers' most common occupation exposures. Multiple exposures appeared to increase the risk. When risk factors were separated by gender, heavy lifting was not a significant risk for males 30-45 years; however, it was a significant risk factor for all women. It was not possible to verify the actual exposures of workers in a manner that would allow translation to clear causative definition (Miranda, 2008).

Several studies using better criteria for diagnosis and work related exposures qualified for a level of "some evidence".

A study related blinded magnetic resonance imaging (MRI) findings of rotator cuff tears, partial and full thickness, to work-related activities that had been created based on actual observed activity among three occupations: house painters, car mechanics and machinists. Car mechanics reported the highest torque associated with their job while force was not an important issue for house painters. Housepainters performed work above 90 degrees for 0.9% of the time and car mechanics for 0.6% of the time or approximately 1 hour per day and ½ hour per day respectively (this was based on the cumulative seconds a task required the arm to remain at or above 90 degrees). In this study, approximately 18.5 years above-shoulder duties as a painter and 33 years with similar duties as a car mechanic would predict MRI evidence of rotator cuff tears (Svendsen, 2004b). Because imaging over-estimates actual symptomatic disease, these results may be overestimates of the actual limits for disease process to occur cumulatively (Conner, 2003). There is some evidence that jobs like that of a house painter, with arm elevation above 90 degrees for more than 30 minutes per day for five or more years, increased the odds of supraspinatus tendinopathy by 27% for each five years of exposure (Svendsen, 2004b).

A cross-sectional study in Denmark of the same three occupations as the MRI study above reported on 732 men who had physical exams performed by blinded examiners was also studied for physical exam findings of supraspinatus pathology. The study provides some evidence that upper arm elevation above 90° increases the odds of shoulder pain with disability, shoulder pain without disability, and supraspinatus tendinitis, with a greater than fourfold increase when the upper arm is elevated at that level for more than 6% of working time (about 30 minutes per day) (Svendsen 2004a).

A final case control study comparing those with shoulder pain and MRI positive for supraspinatus tendon tears found a significantly increased incidence of supraspinatus pathology in employment such as plumbers, mechanics , welders and other metal workers. The time above shoulder work needed to qualify for this was 3,195 lifetime hours or 13.3 years of one hour per week for 48 weeks (Seidler, 2011).

There is some evidence that jobs requiring heavy lifting, heavy carrying, above-shoulder work, and handheld vibration, are likely to be associated with an increased risk of symptomatic supraspinatus tendon lesions, either partial or full thickness tears (Seidler, 2011).

Given all of this information, it is reasonable to consider that there is some evidence for the following causative risk factors for shoulder tendon related pathology:

1. Overhead work consisting of additive time per day of at least 30 minutes/day for a minimum of 5 years.

2. Work that requires shoulder movement at the rate of 15-36 repetitions per minute and no 2 second pauses for 80% of the work cycle.

3. Work that requires shoulder movement with force 10% or greater of the maximum voluntary force and has no 2 second pauses for 80% of the work cycle.

It is also likely that jobs requiring daily heavy lifting at least 10 times per day over the years may contribute to shoulder disorders. In the study relying on self-report, men over 45 and women of any age were more likely to report heavy lifting (probably 20kg or greater) which was significantly related to shoulder findings. Vibration can also be considered an additional risk factor.

Given the lack of multiple high quality studies it is necessary to consider each case individually when dealing with the likelihood of cumulative trauma contributing to or causing shoulder pathology.

3. **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:

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

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

- History of dislocation;

- 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);

- History or exam suggestive of intravenous drug abuse or osteomyelitis; and

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

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

Tests include, but are not limited to:

- Complete Blood Count (CBC) with differential can detect infection, blood dyscrasias, and medication side effects;

- Erythrocyte sedimentation rate (ESR), 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;

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

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

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

5. **OTHER PROCEDURES**

a. **Joint Aspiration**: is a generally accepted, well-established and widely used procedure when specifically indicated and performed by individuals properly trained in these techniques. 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.

Practitioners should be aware of the radiation doses associated with various procedures and provide appropriate warnings to patients. Coloradans have a background exposure to radiation, and unnecessary CT scans or X-rays increase the lifetime risk of cancer death (Hendricks, 2011).

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.

1. **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.

   a. **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 (Jacobson, 1995) and in classifying anatomical specimens (Zuckerman, 1997). 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 (Hirano, 2002; Oh, 2010). Appropriate soft tissue imaging techniques

such as sonography and MRI should be used to assess rotator cuff or bursa status.

b. <u>**Diagnostic Sonography**</u>: There is good evidence that MRI, magnetic resonance arthrography (MRA), and ultrasound (US) are all accurate at identifying full thickness rotator cuff tears in patients whose history and physical examination makes them candidates for possible surgery, and that there is no evidence to suggest that any of the three is superior for this purpose. There is inadequate evidence about the comparative accuracy in partial thickness tears (due to the way that clinically very different categories were combined in the analysis, leading to equivocal interpretation of the findings) ([Cochrane] Lenza, 2013b). 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 (Dinnes, 2003 [Health Technology Assessment]). 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. It may occasionally be used by highly experienced physicians as initial testing when a tear is suspected.

c. <u>**Magnetic Resonance Imaging (MRI)**</u>: 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 intra-articular contrast (MRA) can enhance definition of selected pathologies, (such as a labral tear).

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. There is good evidence that MRI, MRA, and US are all accurate at identifying full thickness rotator cuff tears in patients whose history and physical examination makes them candidates for possible surgery, and that there is no evidence to suggest that any of the three is superior for this purpose. There is inadequate evidence about the comparative accuracy in partial thickness tears (due to the way that clinically very different categories were combined in the analysis, leading to equivocal interpretation of the findings) ([Cochrane] Lenza, 2013b).

d. <u>**Computed Axial Tomography (CT)**</u>: 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. A CT scan is more accurate for bony tissue, whereas an MRI is preferred for visualization of soft tissue.

e. **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 (Magee, 2004), but the arthroscopically normal labrum may produce an abnormal signal in half of MRA studies (Zanetti, 2001). There is good evidence that MRA is marginally more sensitive and specific for the detection of many glenohumeral labral lesions, including SLAP lesions (Smith, 2012c). 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. When utilizing a 1.5 Tesla machine, the addition of contrast allows for more definition of labral and biceps pathology. The recent appearance of 3.0 Tesla machines in some Colorado locations, may over time eliminate the need for contrast studies.

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

g. **Bone Scan (Radioisotope Bone Scanning)**: is generally accepted, well-established and widely used. Bone scanning is more sensitive but less specific than MRI. [99M]Technecium diphosphonate uptake reflects osteoblastic activity and may be useful in metastatic/primary bone tumors, stress fractures, osteomyelitis, and inflammatory lesions, but cannot distinguish between these entities.

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

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

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

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

a. **Diagnostic Subacromial Injection**: There is some evidence that ultrasound-guided injection of corticosteroid into the shoulder provides a more anatomically accurate injection and is likely to have a small to moderate advantage over landmark-guided injection for pain relief at 6 weeks after the injection ([Cochrane] Bloom, 2012).

If there is a concern regarding needle placement, sonography or fluoroscopy may be used. The subacromial injection may also be repeated by a specialist skilled in this procedure to confirm the diagnosis. Please refer to Section F.4.f. Subacromial Injections, for more information.

b. **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.

c. **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. **Electrodiagnostic Testing**: Electrodiagnostic tests include, but are not limited to, 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, brachial plexopathies, 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*.

e. **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:

i.   Employment history;

ii.   Interpersonal relationships — both social and work;

iii.   Leisure activities;

iv.   Current perception of the medical system;

v.   Results of current treatment;

vi.   Perceived locus of control; and

vii.   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 Division's Chronic Pain Disorder Medical Treatment Guidelines.

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

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

a.   **Computer Enhanced Evaluations:** These may include isotonic, isometric, isokinetic and/or isoinertial measurement of movement; 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.

❖ Frequency: One time for evaluation, one for mid-treatment assessment, and one at final evaluation.

b. **Functional Capacity Evaluation (FCE)**: This 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 ROM, coordination and strength, worker habits, employability, as well as psychosocial aspects of competitive employment may be evaluated. Reliability of patient reports and overall effort during testing is also reported. 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. Standardized national guidelines (such as National Institute for Occupational Safety and Health (NIOSH)) should be used as the basis for FCE recommendations.

There is some evidence that an FCE fails to predict which injured workers with chronic low back pain will have sustained return to work (Gross, 2004a). Another cohort study concluded that there was a significant relation between FCE information and return to work, but the predictive efficiency was poor (Streibelt, 2009). There is some evidence that time off work and gender are important predictors for return to work, and floor-to-waist lifting may also help predict return to work, however, the strength of that relationship has not been determined (Matheson, 2002).

A full review of the literature reveals that there is no evidence to support the use of FCEs to prevent future injuries ([Cochrane] Mahmud, 2010). There is some evidence in chronic low back pain patients that (1) FCE task performance is weakly related to time on disability and time for claim closure and (2) even claimants who fail on numerous physical performance FCE tasks may be able to return to work (Gross, 2004b).

Full FCEs are rarely necessary. In many cases, a work tolerance screening or return to work performance will identify the ability to perform the necessary job tasks. There is some evidence that a short form FCE reduced to a few tests produces a similar predictive quality compared to the longer 2-day version of the FCE regarding length of disability and recurrence of a claim after return to work (Gross, 2007).

When an FCE is being used to determine return to a specific jobsite, the provider is responsible for fully understanding the physical demands and the duties of the job the worker is attempting to perform. A jobsite evaluation is usually necessary. A job description should be reviewed by the provider and FCE evaluator prior to having this evaluation performed. FCEs cannot be used in isolation to determine

work restrictions. It is expected that the FCE may differ from both self-report of abilities and pure clinical exam findings in chronic pain patients (Brouwer, 2005). The length of a return to work evaluation should be based on the judgment of the referring physician and the provider performing the evaluation. Since return to work is a complicated multidimensional issue, multiple factors beyond functional ability and work demands should be considered and measured when attempting determination of readiness or fitness to return to work (Gross, 2007). FCEs should not be used as the sole criteria to diagnose malingering.

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

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

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

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

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

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

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

iv. To assist the patient in their return to work by educating them on how they may be able to do their job more safely in a bio-mechanically appropriate manner; and/or

v. To give detailed work/activity restrictions.

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

d.   <u>**Vocational Assessment**</u>: 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 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 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.

e.   <u>**Work Tolerance Screening**</u>: 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

1. 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 bone displacement:

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.9. Impingement Syndrome.

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.

c. Specific Physical Exam Findings may include the following:

i.   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;

ii. The patient usually demonstrates decreased shoulder motion and the distal end of the clavicle is painful with palpation, There may be increased clavicular translation. Cross-body adduction commonly 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. A diagnostic injection of local anesthetic in the AC joint should temporarily relieve pain when performing this maneuver (Tauber, 2013).

d. **Diagnostic Testing Procedures**:

Plain x-rays may include:

i. Anterior/Posterior (AP) view;

ii. AP radiograph of the shoulder with the beam angled 10 degrees cephalad (Zanca view) (Tauber, 2013);

iii. Axillary lateral views; and

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

e. **Non-operative Treatment Procedures may include**:

i. Procedures outlined in Section F.9. Orthotics and Prosthetics, 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.

ii. Medication, such as non-steroidal anti-inflammatories and analgesics would be indicated. Opioids are not normally indicated. Lidocaine patches may be used for pain relief. In chronic acromioclavicular joint pain, injections with or without steroids may be performed up to 3 times in one year.

iii. Benefits may be achieved through therapeutic rehabilitation. It should emphasize a progressive increase in 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. Maladaptive compensatory strain patterns should always be addressed. Refer to Section F. Therapeutic Procedures - Non-operative.

iv. Return to work with appropriate restrictions should begin within the first week. Refer to Section F.13. Return to Work. With restoration of full-motion, return to full-duty should be anticipated within 3 months. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

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

f. **Surgical Indications**:

Patients who have Type III AC joint dislocations are frequently treated surgically in order achieve better cosmetic and radiologic results; however, they will usually recover well with non-surgical treatment (Tauber, 2013). 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 orthopedic 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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

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

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

g. **Operative Procedures**:

AC joint stabilization and ligament reconstruction. When hooks or pins are used, removal may be required at 6-12 weeks.

Continuous interscalene blocks (ISB) are *not recommended*. For more information, please refer to Section G.7. Interscalene Anesthesia.

h. **Post-operative Treatment**:

An individualized rehabilitation program will be 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: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks, 2 - 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 the recommendation of the surgeon.

❖ Optimum Duration: 6 to 8 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

2. ADHESIVE CAPSULITIS/FROZEN SHOULDER DISORDER:

Idiopathic adhesive capsulitis usually occurs spontaneously without any specific inciting injury. This is not normally a work-related condition. The following is limited to a description of the condition, therefore there are no recommendations for treatment. It occurs most frequently in diabetic, middle aged patients. This type of adhesive capsulitis is likely to remit over time. Other risk factors may include thyroid problems, cervical dysfunctions, and other shoulder injuries. It may be useful to order laboratory tests to screen for diabetes.

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 (Lubiecki, 2007). The disorder progresses through stages, specifically:

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

Stage 2-Frozen - Characterized by progressive stiffness, loss of passive range-of-motion, muscular atrophy, and decreased pain; generally lasting an additional 4 to 9 months beyond Stage 1.

Stage 3-Thawing - 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 or at the acromioclavicular joint. Pain is often worse at night, with difficulty sleeping on the involved side particularly in stage 1. Motion, including passive external rotation, is restricted and painful (Robinson, 2012). The common capsular pattern of shoulder range of motion limitation ranges from: external rotation with the highest limitation, followed by abduction, then flexion, internal rotation, with extension presenting with the lowest level of limitation.

In all stages patients may also experience peri-scapular and neck pain from compensatory scapular thoracic motion. It is estimated that 7-15% of patients may have permanent loss of motion, which is usually not functionally disabling (Robinson, 2012).

3. BICIPITAL TENDON DISORDERS:

a. Description/Definition:

Disorders may include: 1) primary bicipital tendinopathy, which is exceedingly rare; 2) secondary bicipital tendinopathy, which is generally associated with rotator cuff tendinitis 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 the 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. Distal tendon rupture may decrease strength of supination.

b. Occupational Relationship:

Onset of symptoms, date, mechanism of onset, occupational history and current job requirements should be correlated with the intensity, character, duration and frequency of associated pain and discomfort. Occupational disorders of the biceps tendon may accompany scapulothoracic dyskinesis, rotator cuff injury, AC joint separation, subdeltoid bursitis, shoulder instability or other shoulder pathology. Symptoms should be exacerbated or provoked by work that activates 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.

Acute trauma to the long head of the biceps tendon of the shoulder girdle may also give rise to occupational injury of the biceps tendon. Those with distal biceps rupture may report an acute event related to an unexpected extension force applied to a flexed elbow (Miyamoto, 2010). The injury is more common in those who smoke and in the dominant arm (Miyamoto, 2010).

c. **Specific Physical Exam Findings may include the following**:

i. 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.

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

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

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

- Yergason's sign.

- Speed's test.

- Ludington's test.

v. Proximal biceps tendon rupture results in a positive hook sign (loss of attachment when the lateral edge of the distal biceps tendon is hooked with the examiner's finger) or positive biceps squeeze test (biceps squeeze does not result in elbow supination).

d. **Diagnostic Testing Procedures**:

i. Plain x-rays include:

A) Anterior/Posterior (AP) view. Elevation of the humeral head is indicative of a rotator cuff tear;

B) Axillary view identifies dislocations and humeral head deficits (Hill-Sachs lesion) and is useful to demonstrate arthritis and spurs on the anterior inferior acromion;

C) Outlet view determines if there is a downwardly tipped acromion.

ii.   Adjunctive testing, such as sonography, MRI, or MRI arthrography should be considered when shoulder pain is refractory to 4 to 6 weeks of an appropriate shoulder rehabilitation program and the diagnosis is not readily identified by standard radiographic and clinical techniques. For distal tendon ruptures, an MRI is done acutely and commonly performed with the elbow flexed, abducted and supinated.

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

i.   Benefit may be achieved through procedures outlined in Section F. Therapeutic Procedures - Non-operative, 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 per week 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. Opioids are not normally indicated.

iii.   Injections: 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. For more information on steroid injections, please refer to Section F.4.d. Shoulder Joint Steroid Injections.

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

f.   **Surgical Indications**:

i.   Acute Distal Biceps Tendon Rupture: normally requires timely surgical repair, although non-operative treatment results in good strength of

flexion and about 20% decrease in supination strength (Miyamoto, 2010). Therefore, operative repair is more appropriate for younger patients or those who require supination strength in the dominant arm to perform job duties or other activities.

ii.   <u>Acute Proximal Long Head Biceps Tendon Rupture</u>: active patient participation in an appropriate shoulder rehabilitation program is often successful; however, earlier operative intervention may be indicated for young patients, manual laborers or others who require forceful flexion regularly for their work.

iii.   <u>Bicipital Tendinitis</u>: 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.   <u>Subluxing Bicipital Tendon</u>: Most patients with this condition also have a subscapularis tear. Surgical stabilization of the bicipital tendon is not commonly indicated. A 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 an appropriate shoulder rehabilitation program.

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications, as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

g.   **Complications:**

Complications depend on the procedure. Distal repairs may injure the lateral antebrachial cutaneous nerve or the posterior interosseous nerve or cause heterotopic ossification. Complications may be higher for chronic repairs (Dillon, 2013). Post-operative fracture, tendon rupture, complex regional pain syndrome, and wound infections have been reported (Quach, 2010).

h.   **Operative Procedures**:

     i.   Distal biceps tendon repair.

     ii.   Repair of rotator cuff pulley lesion.

     iii.   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 subscapular repair or in the presence of an irreparable rotator cuff tear.

         There is some evidence that, in the setting of repairable rotator cuff tears with lesions of the long head of the biceps, there is little difference in functional outcome at two years between tenotomy and tenotomy accompanied by tenodesis (De Carli, 2012). Because tenodesis is a more complex procedure and requires more time off work, it is ***not recommended***.

Continuous interscalene blocks (ISB) are ***not recommended***. For more information, please refer to Section G.7. Interscalene Anesthesia.

i.   **Post-operative Treatment**:

An individualized rehabilitation program will be 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 and distal biceps tendon repair. Extension may gradually increase over 6 weeks. Early loading of the tendon should be avoided. Strengthening is usually delayed until 4 to 6 weeks post-op. 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: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks, 2 - 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 the recommendation of the surgeon.

❖   Optimum Duration: 6 to 8 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

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. Neurapraxia is a temporary blockage of nerve conduction with transient loss of sensory and motor function, resulting from transient nerve compression or traction when external pressure compromises local blood flow. Recovery of function in 8 weeks or less is expected. 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 6 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. During the nerve study, 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.

a. **Brachial Plexus Injuries**:

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, division and cords which ultimately form the peripheral nerves of the arm.

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 (Moghekar, 2007). 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.

iii. 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;

- Atrophy; and/or

- Pain with recreation of the motions related to the mechanism of injury.

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.

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. Treatment Procedures - Non-operative. However, utilization of ultrasound, cold and heat should be discussed with the primary treating physician, since these modalities may aggravate nerve injury.

C) Medications such as analgesics, nonsteroidal anti-inflammatories, anti-depressants and anti-convulsants are indicated and opioids may be indicated acutely. All medications should be prescribed as found in Section F.7. or Section F.5. in Thoracic Outlet Syndrome Medical Treatment Guidelines.

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

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 (Thornton, 2009).

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

vii. Operative Procedures:

- Exploration and repair.

Continuous interscalene blocks (ISB) are *not recommended*. For more information, please refer to Section G.7. Interscalene Anesthesia.

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 and progressive strengthening.

❖ Frequency: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks, 2 - 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 the recommendation of the surgeon.

❖ Optimum Duration: 6 to 8 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

b. **Axillary Nerve**:

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.

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 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. Quadrilateral space syndrome may cause pain in the axillary nerve region with abduction, external rotation, and forward flexion in the scapular plane. This syndrome is most commonly reported in young males and has been associated with overhead sports (Cummins, 2008).

iii. Specific Physical Exam Findings may include:

A) Weakness and atrophy of the deltoid muscle and teres minor;

B) Loss of strength in abduction, flexion, external rotation and extension of the shoulder; and/or

C) Sensory loss is reported over the upper arm.

iv. Diagnostic Testing Procedures:

A) Plain x-rays.

B) EMG and Nerve Conduction Studies six weeks after the injury and repeated at appropriate intervals to assess for reinnervation. Comparison of EMG and Nerve Conduction Velocity (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 asymptomatic subjects when the arm is in abduction and external rotation (Cummins, 2008). This study should only be done after conservative therapy and if surgery is being contemplated.

    v.   Non-operative Treatment Procedures:

    A)   Rehabilitation is based on procedures set forth in Section F. Therapeutic Procedures - Non-operative. However, utilization of ultrasound, and cold and heat should be discussed with the primary treating 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. Electrical stimulation may be used to stimulate the deltoid (Cummins, 2008).

    B)   Medications such as analgesics, nonsteroidal anti-inflammatory, anti-depressants and anti-convulsants are indicated. Opioids may be indicated acutely. All medications should be prescribed as described in Section F.7. or Section F.5. in Thoracic Outlet Syndrome Medical Treatment Guidelines.

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

    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 a space occupying lesion or 3-6 months of conservative treatment with persisting functional deficits, a positive arteriogram, and point tenderness at the posterior quadrilateral space (Cummins, 2008). Overall outcomes of surgery cannot be predicted, as only a small case series have been reported.

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

vii.   Operative Procedures:

- Exploration and repair.

Continuous interscalene blocks (ISB) are ***not recommended***. For more information, please refer to Section G.7. Interscalene Anesthesia.

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 and progressive strengthening.

❖   Frequency: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks, 2 - 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 the recommendation of the surgeon.

❖ Optimum Duration: 6 to 8 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

c. **Long Thoracic Nerve**:

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.

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.

iii. Specific Physical Exam Findings may include:

A) Dull ache in the region of the shoulder exacerbated by tilting the head away from the effected side and without sensory loss;

B) Scapular deformity and/or winging may be described by patient or family; and/or

C) Serratus anterior wasting; and

D) 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.)

iv. Diagnostic Testing Procedures:

A) Plain x-rays.

B) EMG and Nerve Conduction Studies six 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.

v. Non-operative Treatment Procedures:

A) Rehabilitation is based on procedures set forth in Section F. Therapeutic Procedures - Non-operative. Utilization of ultrasound, cold, and heat should be discussed with the primary treating 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 opioids may be indicated acutely. All medications should be prescribed as seen in Section F.7. or Section F.5. in Thoracic Outlet Syndrome Medical Treatment Guidelines.

D) Return to work with appropriate restrictions should be considered early in the course of treatment (Refer to Section F.13. Return to Work). Heavy lifting and other activities that might stress the nerve should be avoided.

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.

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

vii. Operative Procedures:

- Exploration and repair.

- Muscle transfer.

- Scapular fixation is rarely done and requires a second orthopedic opinion.

Continuous interscalene blocks (ISB) are *not recommended*. For more information, please refer to Section G.7. Interscalene Anesthesia.

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, 2 - 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 the recommendation of the surgeon.

❖ Optimum Duration: 6 to 8 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

d. **Musculocutaneous Nerve**:

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.

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.

iii. Specific Physical Exam Findings may include:

A) Weakness and atrophy in the biceps and brachialis; and/or

B) Sensory loss over the lateral aspect of the forearm; however, this is not always seen.

iv. Diagnostic Testing Procedures:

- EMG and Nerve Conduction Studies six 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.

v. <u>Non-operative Treatment Procedures</u>:

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

B) Medications such as analgesics, nonsteroidal anti-inflammatory, anti-depressants and anti-convulsants are indicated and opioids may be indicated acutely. All medications should be prescribed as seen in Section F.7. or Section F.5. in Thoracic Outlet Syndrome Medical Treatment Guidelines.

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

vi. <u>Surgical Indications</u>:

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.

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

vii. Operative Procedures:

- Exploration and repair.

Continuous interscalene blocks (ISB) are *not recommended*. For more information, please refer to Section G.7. Interscalene Anesthesia.

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, 2 - 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 the recommendation of the surgeon.

❖ Optimum Duration: 6 to 8 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

e. **Spinal Accessory Nerve**:

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.

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.

iii. Specific Physical Exam Findings may include:

A) Pain in the shoulder;

B) Asymmetrical neckline;

C) Scapular winging with the arms out to the side, abduction, or with external rotation;

D) Weakness or paralysis of the trapezius with weakness in forward flexion or abduction above 90 degrees; and/or

E) Drooping of the shoulder.

iv. Diagnostic Testing Procedures:

A) EMG and Nerve Conduction Studies six 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.

v. Non-operative Treatment Procedures:

A) Rehabilitation is based on procedures set forth in Section F. Therapeutic Procedures - Non-operative. Utilization of ultrasound, cold and heat should be discussed with the primary treating 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.13. Return to Work.

C) Medications such as analgesics, nonsteroidal anti-inflammatory, anti-depressants and anti-convulsants are indicated and opioids may be indicated acutely. All medications should be prescribed as seen in Section F.7, or Section F.5.in Thoracic Outlet Syndrome Medical Treatment Guidelines.

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.

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

vii. Operative Procedures:

- Exploration and repair.

- Tendon transfer – Trapezius, levator scapular, rhomboids.

- Scapular fixation for cases with heavy work demands and failed previous procedures.

Continuous interscalene blocks (ISB) are ***not recommended***. For more information, please refer to Section G.7. Interscalene Anesthesia.

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, 2 - 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 the recommendation of the surgeon.

❖   Optimum Duration: 6 to 8 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

f.   **Suprascapular Nerve**:

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.

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 arm can cause injury 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 volleyball players in one study had asymptomatic infraspinatus atrophy secondary to nerve damage. Pain may be worsened by cross-body adduction and internal rotation. Exacerbation or fatigue with overhead throwing activities is common (Moen, 2012). 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 large rotator cuff tear. Symptoms include deep aching pain at the top of the shoulder (Shah, 2011).

iii.   Specific Physical Exam Findings may include:

A)   Wasting at the supraspinatus and/or infraspinatus muscles with weakness of external rotation and abduction with overhead activity;

B)   Pain at the shoulder; and/or

C)   A positive Tinel's eliciting a provocative pain response.

iv.   Diagnostic Testing Procedures:

A)   EMG and Nerve Conduction Studies six 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)   A suprascapular fluoroscopically or ultrasound guided suprascapular diagnostic injection may be useful when EMG/NVC is negative and the patient has persistent symptoms.

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

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

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 (Safran, 2004).

B) Rehabilitation is based on procedures set forth in Section F. Therapeutic Procedures - Non-operative. An emphasis should be placed on posture; maintaining full shoulder motion; strengthening; stretching the posterior capsule; and scapular stabilization and mechanics (Moen, 2012). Utilization of ultrasound, cold and heat should be discussed with the primary treating physician, since these modalities can aggravate nerve injury.

C) Medications such as analgesics, nonsteroidal anti-inflammatory, anti-depressants, and anti-convulsants are indicated and opioids may be indicated acutely. All medications should be prescribed as seen in Section F.7, or Section F.5. in Thoracic Outlet Syndrome Medical Treatment Guidelines.

D) Return to work with appropriate restrictions should be considered early in the course of treatment (Refer to Section F.13. Return to Work). Heavy lifting or overhead activities that aggravate the condition should be avoided.

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. (Refer to Section B.9 Surgical Interventions)

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed

decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

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.

Continuous interscalene blocks (ISB) are ***not recommended***. For more information, please refer to Section G.7. Interscalene Anesthesia.

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, 2 - 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 the recommendation of the surgeon.

❖   Optimum Duration: 6 to 8 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to

the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

5. BURSITIS:

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.

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.

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. Bursitis is often a sequela of an occupational strain or tendinopathy in the absence of other mitigating factors.

c. Specific Physical Exam Findings may include:

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

ii. Painful arc may be seen between 60 and 110 degrees; and/or

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

d. Diagnostic Testing Procedures:

i. Plain x-rays include:

A) AP view. Elevation of the humeral head indicates rotator cuff tear;

B) Axillary view identifies dislocations and humeral head deficits (Hill-Sachs lesion) and is useful to demonstrate arthritis and spurs on the anterior inferior acromion;

C) Outlet view determines if there is a downwardly tipped acromion.

ii.   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.

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 neuromuscular re-education 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.13. 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. Injection into the tendon can cause possible tendon breakdown, tendon degeneration, or rupture. Injections should be minimized for patients under 30 years of age. For more information on steroid injections, please refer to Section F.4.d. Shoulder Joint Steroid Injections.

v.   Botulinum Injection:

There is some evidence that in patients with subacromial bursitis or subacromial impingement syndrome, a single ultrasound-guided subacromial injection of botulinum toxin B may be more effective than a steroid injection in pain reduction and shoulder function 3 months after the injection, but the usefulness of repeated botulinum toxin injections is not known (Lee, 2011b).

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

f. **Operative Procedures**:

Surgery is not commonly indicated for bursitis. Refer to impingement syndrome and other related diagnoses in Section E. Specific Diagnosis Testing and Treatment Procedures.

Continuous interscalene blocks (ISB) are *not recommended*. For more information, please refer to Section G.7. Interscalene Anesthesia.

6. **CALCIFIC TENDINITIS**:

a. **Description/Definition**:

Calcific tendinitis 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 pain-producing symptoms in some adults (7.5% to 20%) (Speed, 1999). The calcific 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, and by impingement signs. After resorption, granulation tissue replaces the area of calcification.

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.

b. **Occupational Relationship**:

Symptomatic calcific tendinitis does not have a known direct occupational relationship. It is thought to be related to degeneration of the supraspinatus tendon. This can be aggravated by specific work exposures.

c. **Specific Physical Exam Findings may include**:

i. Pain with palpation to the shoulder with active or passive abduction and external rotation of the shoulder (painful arc);

ii. Pain with specific activation of the involved muscles; and/or

  iii. Pain with impingement signs;

  iv. Severe pain on examination in some cases.

d. **Diagnostic Testing Procedures**:

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

  ii. 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.

  iii. Endocrine testing may be appropriate, since those with hypothyroidism, autoimmune issues, and estrogen related dysfunction appear to have a longer, more complex course and present at a younger age (Harvie, 2007).

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 acetic acid iontophoresis (Kachewar, 2013). Therapy should progress to instruction in a home exercise program targeted to ongoing ROM and neuromuscular re-education 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 and analgesics. Cimetidine 200mg twice daily for 3 months has also been proposed (Yokoyama, 2003). Refer to Section F.7. Medications.

  iii. 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day. Refer to Section F.13. Return to Work.

  iv. Therapeutic ultrasound (Refer to Section F.15. Therapy-Passive.) Ultrasound may be used for tendinitis. 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 (Ebenbichler, 1999).

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. One study followed similar patients who had an ultrasound directed double needle lavage and those who did not. Significant differences in favor of the procedure for pain relief and improvement in Constant score appeared at one month and persisted through one year (Serafini, 2009). The procedure is performed in 15-20 minutes and is not resource intensive (Sconfienza, 2013). It requires prior authorization but may be an appropriate therapy in select patients who fail other conservative treatment. Subacromial injections have been used with lavage (Yoo, 2010).

vi. There is some evidence that low energy radial shock wave therapy may be beneficial in the setting of calcific tendinitis (Cacchio, 2006). This technique is less painful than high energy extracorporeal shock wave therapy (ESWT) and can be specifically directed. There is also good evidence that both high energy and low energy ESWT may provide functional benefits in the setting of calcific tendinitis, and may reduce the size of the calcific deposits and reduce pain (Gerdesmeyer, 2003; Pan, 2003). Radial shock wave therapy uses lower energy. 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. For more information on steroid injections, please refer to Section F.4.d. Shoulder Joint Steroid Injections.

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

f. **Surgical Indications**:

Surgical procedure is rarely necessary for this condition. 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, it may be considered. 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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

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.

Continuous interscalene blocks (ISB) are *not recommended*. For more information, please refer to Section G.7. Interscalene Anesthesia.

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. Therapeutic Procedures - Non-operative should be considered.

❖ Frequency: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks, 2 - 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 the recommendation of the surgeon.

❖ Optimum Duration: 6 to 8 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day. 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.

7. FRACTURES:

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

a. Clavicular Fracture:

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

ii. Specific Physical Exam Findings may include:

- Pain along the clavicle;

- Abrasions on the chest wall, clavicle or shoulder;

- Deformities in the above regions; and/or

- Pain with palpation and motion at the shoulder joint area.

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.

iv.   Non-operative Treatment Procedures:

A)   Most clavicular fractures, particularly the non-displaced mid-shaft fractures, are adequately managed by closed techniques and do not require surgery. After reduction, the arm is immobilized in a sling. 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. Therapeutic Procedures - Non-operative.

B)   Medication, such as analgesics and nonsteroidal anti-inflammatories, would be indicated; opioids may be indicated acutely for fractures and should be prescribed as indicated in Section F.7. Medications. There is some evidence that in the setting of long bone fractures of the femur, tibia, and humerus, administration of non-steroid anti-inflammatory drugs (NSAIDs) in the first 48 hours after injury is associated with poor healing of the fracture (Jeffcoach, 2014).

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, preferably through a healthy diet (National Osteoporosis Foundation, 2013). 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 and male patients over 70 should be screened for osteoporosis. Patients who have been on prednisone at a dose of 5mg or more for more than 3 months should be evaluated for glucocorticoid induced osteoporosis. An osteoporosis evaluation may be considered for younger post-menopausal or menopausal in transition women, for patients on medications that can cause bone loss, or patients who have suffered a fracture due to a low-impact fall or with minimum to no provocation. Risk factors for osteoporosis include current smoking, alcohol 3 or more drinks per day, low body mass index, rheumatoid arthritis, and other associated conditions such as hypogonadism, type 1 diabetes (National Osteoporosis Foundation, 2013). Vitamin D levels may also be ordered. Patients may require additional medication based on bone mineral density testing. All patients should be encouraged to participate in regular weight-bearing and muscle-strengthening

exercise, eat a diet rich in fruits and vegetables, and avoid excessive alcohol intake (National Osteoporosis Foundation, 2013). 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) There is some evidence that tobacco use is also a risk factor for poor fracture healing; therefore it is recommended that insurers cover a smoking cessation program peri-operatively (Jeffcoach, 2014). If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

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

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 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 and those with clavicular shortening of 15 mm or more, may be an indication for surgical repair.

There is strong evidence that operative treatment of displaced midshaft clavicular fractures lead to lower rates of nonunion and symptomatic malunion compared to treatment with a sling, but patients with preferences for nonoperative treatment may be counseled that they will probably do well, even though their fractures may not heal as well. There is inadequate evidence that patient-reported functional outcomes are significantly better for surgery than for conservative treatment at one year (McKee, 2012; [Cochrane] Lenza, 2013a). A two year follow-up of one of the studies showed no change in functional status (Schemitsch, 2011).

There is some evidence that open reduction and internal fixation of comminuted midshaft clavicle fractures leads to less pain and disability at one year than closed treatment of the same fractures (Mirzatolooei, 2011).

Surgical correction is generally not necessary for midshaft fractures but may be considered based on severe displacement or presence of risk factors.

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

There is some evidence that tobacco use is also a risk factor for poor fracture healing; therefore it is recommended that insurers cover a smoking cessation program peri-operatively (Jeffcoach, 2014). If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

vi.   <u>Operative Procedures</u>: Repair of fracture or associated distal clavicular resection using plates and screws or an intramedullary device.

Continuous interscalene blocks (ISB) are ***not recommended***. For more information, please refer to Section G.7. Interscalene Anesthesia.

vii.   <u>Post-operative Treatment</u>: 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. Therapeutic Procedures - Non-operative.

viii.   <u>Bone-Growth Stimulators</u>:

A)   <u>Electrical</u>: High quality literature of electrical bone growth stimulation is lacking for shoulder injuries. Literature is conflicting in the use of electrical stimulation in other regions of the body ([Cochrane] Griffin, 2011). Due to a lack of supporting scientific evidence, it requires prior authorization.

B) Low-intensity Pulsed Ultrasound: There is good evidence that low-intensity pulsed ultrasound (LIPUS) does not influence the healing of new non-displaced mid shaft clavicle fractures (Lubbert, 2008). Therefore, it is *not recommended*.

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 (Brorson, 2008). 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.

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 include glenohumeral dislocation; stretch injuries to the axillary, musculocutaneous, and radial nerves; and axillary artery injuries with high-energy accident.

ii. 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.

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 dislocation.

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

C) Classification can be by the Neer method. however, there is poor agreement among observers using this method. 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.

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 (Hodgson, 2007). Immobilization without physical therapy for more than one week is ***not recommended***. Complications of conservative treatment include 15% loss of motion, possible subacromial impingement from displaced tubercle and necrosis of humeral head (Burkhart, 2013).

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; opioids may be indicated acutely for fracture and should be prescribed as indicated in Section F.7. Medications. There is some evidence that in the setting of long bone fractures of the femur, tibia, and humerus, NSAID administration in the first 48 hours after injury is associated with poor healing of the fracture (Jeffcoach, 2014).

D) Ultrasound and shockwave therapy are ***not recommended*** as routine treatment for acute fractures, as there is insufficient evidence to support their use (Griffin, 2012).

E) 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.

F) Pendulum exercises are usually done at 2-3 weeks followed by active assisted physical therapy to 90º abduction and flexion (Burkhart, 2013). Subsequently, with pain control, the therapy program can be progressed with therapeutic approaches as described in Section F. Therapeutic Procedures - Non-operative. Home exercises are essential for recovery.

❖ Time to Produce Effect: 6 sessions.

❖ Optimum Duration: 9 sessions.

❖ Maximum Duration: 12 to 24 sessions.

G)   Use of the injured arm at work is determined by the orthopedist. The patient may, however, return to work without use of the injured arm soon after the injury. Refer to Section F.13. Return to Work.

H)   Also refer to osteoporosis in this Section E.7.a. Clavicular Fracture.

I)   There is some evidence that tobacco use is also a risk factor for poor fracture healing; therefore it is recommended that insurers cover a smoking cessation program peri-operatively (Jeffcoach, 2014). If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

v.   Surgical Indications: There is insufficient evidence to determine the management of proximal humeral fractures. Early physiotherapy, without immobilization, may be sufficient for some undisplaced fractures. Absolute indications include open fractures, vascular injuries, neurologic damage and true humeral head splits (Widnall, 2013). It is unclear whether surgery consistently produces better long-term outcomes. Surgery is associated with a higher risk of complications and re-operative rate. There is insufficient evidence to establish what is the best type of surgical treatment. There is insufficient evidence to say when to start mobilization after either surgical fixation or hemiarthroplasty (Handoll, 2012).

    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. Younger patients should usually be considered for surgical repair (Burkhart, 2013).

    C)   Three and four-part fractures frequently require operative treatment (Widnall, 2013). Head preserving treatment is preferred over hemiarthroplasty (Tepass, 2013). Plated fractures have an excellent functional success rate (Martetschlager, 2012). 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. Hemiarthroplasty provides pain relief but frequently results in limited range of motion (Wiesel, 2013). For four-part fractures with a fractured greater tuberosity, reverse arthroplasties have also been described. This procedure is described under Section G.6. Shoulder Replacement (arthroplasty).

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

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

There is some evidence that tobacco use is also a risk factor for poor fracture healing; therefore it is recommended that insurers cover a smoking cessation program peri-operatively (Jeffcoach, 2014). If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

vi. Operative Procedures:

Percutaneous or internal fixation of the fracture or arthroplasty.

Continuous interscalene blocks (ISB) are *not recommended*. For more information, please refer to Section G.7. Interscalene Anesthesia.

vii. Complications: occur in about 30% of cases and include necrosis of the humeral head, impingement, loss of reposition, and plate breakage. The highest complication rates are for reverse shoulder arthroplasty which may be up to four times higher than hemiarthroplasty with similar functional outcomes (Namdari, 2013; Brorson, 2013). Complication rates are also common for conventional plate surgery (Tepass, 2013).

viii. Post-operative Treatment:

A) An individualized rehabilitation program based upon communication between the surgeon and the therapist using the treatment found in Section F. There is insufficient evidence to determine when mobilization should be started after either surgical fixation or hemiarthroplasty (Handoll, 2012).

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. ESWT has not been tested in prospective controlled studies. They are all considered experimental and are *not recommended* at this time ([Cochrane] Griffin, 2012).

D) Bone-Growth Stimulators. (Refer to this Section E.7.a. Clavicular Fractures.)

E) Hyperbaric oxygen therapy – there is no evidence to support long-term benefit of hyperbaric oxygen therapy for non-union of upper extremity fractures. It is *not recommended* ([Cochrane] Bennett, 2012).

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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

ix. Bone-Growth Stimulators: Refer to Section E.7.a.viii.

c. Humeral Shaft Fractures:

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.

ii. 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.

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.

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. Opioids may be indicated acutely for fracture and should be prescribed as indicated in Section F.7. Medications. There is some evidence that in the setting of long bone fractures of the femur, tibia, and humerus, NSAID administration in the first 48 hours after injury is associated with poor healing of the fracture (Jeffcoach, 2014).

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.13. 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 E.7.a. Clavicular Fracture.

H) There is some evidence that tobacco use is also a risk factor for poor fracture healing; therefore it is recommended that insurers cover a smoking cessation program peri-operatively (Jeffcoach, 2014). If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

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.

- Non-union of conservatively treated fractures (closed fracture treatment for 6-8 weeks) is an indication for open reduction with internal fixation and plating with bone graft. This procedure has good functional outcomes and greater than 90% rate of union (Cadet, 2013).

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

There is some evidence that tobacco use is also a risk factor for poor fracture healing; therefore it is recommended that insurers cover a smoking cessation program peri-operatively (Jeffcoach, 2014). If a treating physician recommends a specific smoking cessation program

peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

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). 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 (Dimitriou, 2005; Evans, 2004). Ectopic ossification into adjacent muscle has been reported to restrict motion in periarticular fractures (Wysocki, 2007). Due to lack of information on the incidence of complications and overall success rate, it is ***not recommended***.

No randomized trials of rh-BMP2 for humerus fractures have been found at the time of this guideline publication. Currently, there is a paucity of evidence for its use in fractures of the upper extremity.

Continuous interscalene blocks (ISB) are ***not recommended***. For more information, please refer to Section G.7. Interscalene Anesthesia.

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. Therapeutic Procedures - Non-operative. Active elbow and wrist motion may

be started immediately.

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

❖ Frequency: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks, 2 - 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 the recommendation of the surgeon.

❖ Optimum Duration: 6 to 8 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

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

d. **Scapular Fractures**:

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.

ii. 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).

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.

- CT tomography with holographic reconstruction is a valuable pre-operative evaluative tool.

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. The majority of scapular fractures are treated non-operatively and have favorable results, particularly scapular body fractures (Gosens, 2009).

B)   Medication, such as analgesics and nonsteroidal anti-inflammatories, would be indicated. Opioids may be indicated acutely for fracture and should be prescribed as indicated in Section F.7. Medications. There is some evidence that in the setting of long bone fractures of the femur, tibia, and humerus, NSAID administration in the first 48 hours after injury is associated with poor healing of the fracture (Jeffcoach, 2014).

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. Therapeutic Procedures - Non-operative.

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

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

v.   Surgical Indications:

- Displaced acromial fractures.

- Displaced glenoid fractures.

- Displaced scapular body fractures in rare circumstances.

- Displaced fractures of the scapular neck and the ipsilateral clavicle.

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

There is some evidence that tobacco use is also a risk factor for poor fracture healing; therefore it is recommended that insurers cover a smoking cessation program peri-operatively (Jeffcoach, 2014). If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

vi. Complications: Complications occur in less than 10% of cases and include non-union, infection, removal of hardware, and damage to the axillary or suprascapular nerve (Lantry, 2008).

vii. Operative Treatment:

A) Displaced acromial fractures are treated with internal fixation.

B) Displaced glenoid fossa 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 (Lantry, 2008; Limb, 2012). Glenoid neck fractures with more than 40⁰ of rotation or 1 cm medial displacement are associated with higher likelihood of symptoms and weakness and may require fixation (Limb, 2012).

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 may require internal fixation of the clavicle to reduce the scapular neck fracture. However, if ligaments are intact they will heal well with conservative care (Lantry, 2008).

Continuous interscalene blocks (ISB) are ***not recommended***. For more information, please refer to Section G.7. Interscalene Anesthesia.

viii. 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. Therapeutic Procedures - Non-operative. 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: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks, 2 - 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 the recommendation of the surgeon.

❖ Optimum Duration: 8 to 10 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

ix. Bone-Growth Stimulators: Refer to Section E.7.a.viii.

e. Sternoclavicular Dislocation/Fracture:

i. Occupational Relationship: Sudden trauma to the shoulder/anterior chest wall. Instability can also occur secondary to atraumatic conditions such as arthritis or muscle pattern issues (Sewell, 2013).

ii.   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.

iii.   Diagnostic Testing Procedures:

A)   Plain x-rays of the sternoclavicular joint are routinely done. When indicated, comparative views of the contralateral limb or specialized views may be necessary. Posterior dislocations may be more difficult to diagnose by physical exam or plain x-ray (Sewell, 2013).

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.

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. Therapeutic Procedures - Non-operative.

C)   Medications, such as analgesics and nonsteroidal anti-inflammatories, would be indicated. Opioids may be indicated acutely for fracture and should be prescribed as indicated in Section F.7. Medications. There is some evidence that in the setting of long bone fractures of the femur, tibia, and humerus, NSAID administration in the first 48 hours after injury is associated with poor healing of the fracture (Jeffcoach, 2014).

D)   Biofeedback and physiotherapy may be used when an inappropriate pectoralis major recruitment pattern is present (Sewell, 2013)

E) Steroid injections are occasionally used (Sewell, 2013).

F) Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F.13. Return to Work. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

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

H) There is some evidence that tobacco use is also a risk factor for poor fracture healing; therefore it is recommended that insurers cover a smoking cessation program peri-operatively If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. (Jeffcoach, 2014). If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

v. Surgical Indications:

- Failure of closed reduction, or recurrent dislocation.

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

There is some evidence that tobacco use is also a risk factor for poor fracture healing; therefore it is recommended that insurers cover a smoking cessation program peri-operatively (Jeffcoach, 2014).Physicians may monitor smoking cessation with laboratory tests

such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

<ol type="i" start="6">
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.

Continuous interscalene blocks (ISB) are *not recommended.* For more information, please refer to Section G.7. Interscalene Anesthesia.

<ol type="i" start="7">
Post-operative Treatment:

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

A) 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, 2 - 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 the recommendation of the surgeon.

❖ Optimum Duration: 6 to 8 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

<ol type="i" start="8">
Bone-Growth Stimulators: Refer to Section E.7.a.viii.

8. POST TRAUMATIC STIFF SHOULDER

Capsular contraction or stiffness may occur secondary to trauma or surgery. Therapy and

additional treatment recommendations for other specific diagnoses should be strictly followed to decrease the occurrence of secondary restricted ROM.

a. Occupational Relationship:

There should be some history of work related injury or surgery resulting in decreased range of motion.

b. Specific Physical Exam Findings may include:

Restricted active and passive glenohumeral ROM is often uniplanar. Posterior capsule tightness often presents with loss of internal rotation. The contralateral asymptomatic limb is useful to help diagnose ROM loss. A 20 degree difference is usually significant.

c. Diagnostic Testing Procedures:

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

ii. 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.

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

d. Non-operative Treatment Procedures:

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

i.   Non-operative 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 neuromuscular re-education of the shoulder girdle musculature. 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 for active therapy: 8 sessions.

   ❖   Frequency: 2 times per week for the first 2 weeks and 2 or less thereafter per week.

   ❖   Optimum Duration: 12 to 14 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.13. Return to Work.

iii. Medications, such as NSAIDS and analgesics, may be helpful. Opioids may be used for post-manipulation or post-operative cases. Judicious use of pain medications to optimize function may be indicated. Opioid use is generally limited to 2 weeks. Refer to Section F.7. Medications.

iv. 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:

A) 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 preferably with ultrasound or fluoroscopic guidance. There is some evidence that arthrographic distention of up to 90 ml of fluid is better than injection of only 6 ml of placebo in improving function and pain for patients with painful stiff shoulder lasting more than three months (Buchbinder, 2004). Early therapy to maintain ROM, and restore strength and function should follow distension arthrography

B) 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.

C) Dynamic splinting may be appropriate for rare cases when a functional ROM has not been achieved with the treatment listed above. Use must be justified by documented failure of active therapy.

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

e. **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.

Contraindications to 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.

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

f.   <u>Operative Procedures</u>:

Manipulation under anesthesia may be done in combination with steroid injection or capsular release.

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.

Continuous interscalene blocks (ISB) are *not recommended*. For more information, please refer to Section G.7. Interscalene Anesthesia.

g.   <u>Post-operative Treatment</u>:

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 and should progress to strengthening exercises.

❖ Frequency: Suggested frequency pattern is 3 to 5 times per week for the first 2 weeks, 2 - 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 the recommendation of the surgeon.

❖ Optimum Duration: 6 to 8 weeks with progression to home exercise and/or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

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

9. ROTATOR CUFF SYNDROME/IMPINGEMENT SYNDROME AND OTHER ASSOCIATED SHOULDER TENDINOPATHIES:

a. Description/Definition:

A collection of symptoms, not a pathologic diagnosis. The extrinsic theory of pathology attributes most symptoms to 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 intrinsic theory would relate symptoms to issues with scapular motion and other muscle function. It is thought that impingement may occur in part because of abnormal scapular motion with increased upper trapezius activation and lesser involvement of middle, lower trapezius and the serratus anterior (Cricchio, 2011;

Kibler, 2012). 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.

Tendinopathy: includes the terms tendinitis, an inflammation of the tendon and tendinosis, non-inflammatory degenerative processes. Rotator cuff tendinopathy 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. These structures include one internal rotator (subscapularis), and two external rotators (infraspinatus and teres minor), and the supraspinatus which assists in abduction.

    i.   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. Pain is often felt down the lateral aspect of the upper arm near the deltoid insertion or over the anterior proximal humerus.

b.   **Occupational Relationship**:

Onset of symptoms, date, mechanism of onset, occupational history, and current job requirements should be correlated with the intensity, character, duration and frequency of associated pain and discomfort. Tendinopathies are often seen with frequent overhead motion. Symptoms may include pain and/or achiness that occur after blunt trauma or repetitive use of the shoulder. For details refer to Section C.2. Relationships to Work and Other Activities.

c.   **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:

    i.   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.

ii.   Passive motion through the 60 to 110 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.

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

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

v.   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.

vi.   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.

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

viii.   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.

ix.   Painful arc may be seen between 60 and 110 degrees.

Impingement syndromes commonly co-exist with other shoulder abnormalities such as rotator cuff tears, AC joint arthritis, biceps tendon ruptures, calcific tendinitis, 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 (Calis, 2000).

Refer to Section C.1.c. Initial Diagnostic Procedures, for a description of each test.

d. **Diagnostic Testing Procedures**:

i. 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) Axillary view identifies dislocations and humeral head deficits (Hill-Sachs lesion) and is useful to demonstrate arthritis, spurs on the anterior inferior acromion, and os acrominale (an unfused accessory center of ossification in the acromion).

C) 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 (Hirano, 2002).

ii. Adjunctive testing, sonography or MRI, may be considered when shoulder pain is refractory to 4 to 6 weeks of an appropriate shoulder rehabilitation program and the diagnosis is not readily identified by a good history and clinical examination. (Refer to Section D. Follow-up Diagnostic Imaging and Testing Procedures.)

iii. 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. 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 (Skedros, 2007). 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 (Lim, 2005; Kirkley, 2002). Please refer to Section F.4.f. Subacromial Injections, for more information.

If there is a concern regarding needle placement, sonography, fluoroscopy or referral to a specialist may be appropriate.

There is some evidence that subacromial injection of 60 mg of ketorolac is at least as effective as an injection of 40 mg of triamcinolone in the short-term treatment of subacromial impingement syndrome (Min, 2013).

For more information on steroid injections, please refer to Section F.4.d. Shoulder Joint Steroid Injections.

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. It is thought that impingement may occur in part because of abnormal scapular motion with increased upper trapezius activation and lesser involvement of middle, lower trapezius and the serratus anterior (Cricchio, 2011; Kibler, 2012). Because impingement can be caused by a number of different pathological conditions, these causes should be thoroughly investigated before a therapy plan is begun.

ii. Benefits may be achieved through active therapeutic interventions.

There is strong evidence for those with subacromial impingement syndrome that; 1) exercise has a small to moderate effect in reducing pain and improving function in the short term; 2) exercise has a small to moderate effect in improving function in the long-term. There is good evidence that exercise provides moderate improvement in strength in the short-term. Common exercises used in the studies are scapular stability training and progressive rotator cuff strengthening exercises using pulley equipment or elastic resistance bands under supervision 1 to 2 times per week along with daily home exercises. Exercises are conducted through range to 90° abduction (Hanratty, 2012).

There is some evidence that a specific exercise strategy, focusing on strengthening eccentric exercises for the rotator cuff and concentric/eccentric exercises for the scapula stabilizers, is effective in reducing pain and improving shoulder function in patients with persistent subacromial impingement syndrome. In addition, this specific exercise strategy reduces the need for arthroscopic subacromial decompression within the three month timeframe used in the study (Holmgren, 2012). There is some evidence that a scapular focused exercise treatment protocol that includes scapular motor control exercises, scapular mobilizations, and stretching is effective for reducing pain and improving shoulder function in patients with subacromial impingement syndrome (Struyf, 2013).

Exercise programs 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. In patients with scapular dyskinesis, neuromuscular reeducation may first be needed to assure the patient will be able to perform these exercises with the necessary proper scapular stabilization. Therapy should progress to strengthening and an

independent home exercise program targeted to further improve ROM and neuromuscular re-education of the shoulder girdle musculature. Refer to Section F. Therapeutic Procedures - Non-operative.

iii. Manual therapy may be useful. There is some evidence that in the setting of shoulder impingement syndrome, a program of six half-hour sessions of manual therapy combined with a home stretching and strengthening exercise program is more effective than a program of six half-hour sessions of supervised performance of the same stretching and strengthening exercise program (Bang, 2000). There is some evidence that 6 sessions of manual physical therapy over a three week period are as effective as an injection of 40 mg triamcinolone for relief of symptoms of shoulder impingement symptoms and impairment up to one year after initial treatment. The same study also showed reduced use of health care services one year in the manual therapy group (Rhon, 2014). Given the evidence, manual therapy with exercise is likely to improve shoulder function for nonspecific rotator cuff pathology (Bennell, 2010).

❖ Time to effect: 6 sessions

❖ Optimum Duration: 12 sessions

❖ Maximum duration:18 sessions

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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day. Refer to Section F.13.

v. Medications, such as nonsteroidal anti-inflammatories and analgesics, may be prescribed. Refer to Section F.7. Medications.

vi. 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. For more information on steroid injections, please refer to Section F.4.d. Shoulder Joint Steroid Injections.

vii. There is strong evidence that subacromial steroid injections for rotator cuff tendinopathy can produce rapid benefit. However, there is no evidence that it differs from alternative therapies for intermediate or long-term relief (Coombes, 2010).

viii. There is some evidence that both subacromial corticosteroid injection and a series of 10 acupuncture treatments combined with home exercises significantly decreased pain and improved shoulder function in patients with subacromial impingement syndrome, but neither treatment was significantly superior to the other (Johansson, 2011).

ix. There is some evidence that in patients with subacromial bursitis or subacromial impingement syndrome, a single ultrasound-guided subacromial injection of botulinum toxin B may be more effective than a steroid injection for pain reduction and increased shoulder function 3 months after the injection, but the usefulness of repeated botulinum toxin injections is not known (Lee, 2011b). Refer to Section F.4.a. Botulinum Toxin Injections for more information.

x. There is good evidence that subacromial injection of hyaluronic acid is not more effective than steroid or placebo for pain relief and functional improvement of subacromial impingement syndrome (Penning, 2012). Therefore, it is ***not recommended***.

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

xii. There is good evidence that a clinically important effect of low level laser therapy on pain and range of motion is unlikely (Abrisham, 2011; Dogan, 2010; Yeldan, 2009). Therefore, it is ***not recommended***.

f. **Surgical Indications**:

i. Related Evidence:

There is some evidence that in the setting of non-traumatic subacromial impingement syndrome, bursectomy can decrease shoulder pain and improve function (Henkus, 2009). There is also some evidence that adding acromioplasty to bursectomy is not likely to significantly enhance the outcome of surgery (Henkus, 2009).

One high quality study compared two groups of patients undergoing arthroscopic acromioplasty: one group had an individualized home exercise program from a physiotherapist which used a painless series of repetitions with elastic stretch bands and light weights, aimed at strengthening the rotator cuff tendon and other shoulder girdle muscles. The other group had the same exercise program following arthroscopic acromioplasty plus release of the coracoacromial ligament. The results at 24 months were similar, but recovery occurred more rapidly in the acromioplasty patients. Thus, there is good evidence that in patients who have shoulder impingement but do not have osteoarthritis or rotator cuff tears, an individualized exercise program yields long-term (24 month) pain relief comparable to the same program following acromioplasty, but also that recovery is more rapid with acromioplasty (Ketola,

2009).Therefore, acromioplasty is ***not generally recommended***
([American Academy of Orthopaedic Surgeons (AAOS), 2010](#); [Arce,
2013](#)).

ii.   Indications:

When functional deficits interfere with activities of daily living and/or job
duties after 3 to 6 months of active patient participation in an appropriate
shoulder rehabilitation program, 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.

Informed decision making should be documented for all invasive
procedures. This must include a thorough discussion of the pros and
cons of the procedure and the possible complications as well as the
natural history of the identified diagnosis. Since most patients with the
most common conditions will improve significantly over time, without
invasive interventions, patients must be able to make well-informed
decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients
should be strongly encouraged to stop smoking and be provided with
appropriate counseling by the physician. If a treating physician
recommends a specific smoking cessation program peri-operatively, this
should be covered by the insurer. Physicians may monitor smoking
cessation with laboratory tests such as cotinine levels. The surgeon will
make the final determination as to whether smoking cessation is required
prior to surgery.

g.   **Complications**: Re-operative rate is reported at about 16% ([Chin, 2007](#)).
Shoulder instability can occur with more aggressive surgery.

h.   **Operative Procedures**:

Procedures for impingement without a rotator cuff tear might include bursectomy
with or without acromioplasty. An open or arthroscopic acromioplasty is not
always necessary as an adjunct to rotator cuff repair and acromioplasty is ***not
generally recommended***.

If after three months of active therapy and injection there is insufficient function,
surgery may be considered. Spurs from the acromion may be removed ([Arce,](#)

2013). The distal clavicle should not be removed unless there is AC joint pain reproducible with direct compression. Preservation of the coracoacromial ligament is recommended to maintain joint stability.

Continuous interscalene blocks (ISB) are ***not recommended***. For more information, please refer to Section G.7. Interscalene Anesthesia.

i. Post-operative Treatment:

An individualized rehabilitation program will be 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 exercises, 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 exercises with gradual return to full activity at 2-3 months if there is no associated rotator cuff tear.

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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

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.

10. ROTATOR CUFF TEAR:

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; however, they are uncommon. Approximately 25% of asymptomatic patients over 60 have full thickness tears and between 40-60% have partial thickness tears (Sher, 1995). About 50%of those with asymptomatic full thickness tears will become symptomatic with tear progression in 2 years (Yamaguchi, 2001). This is more common with larger initial tears (Mall, 2010). Only about 10% of partial tears increase in size over time (Maman, 2009). Tendons do not repair themselves over time (Tashjian, 2012). The patient usually complains of pain along anterior, lateral shoulder or posterior glenohumeral joint.

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. 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 use. For details refer to Section C.2 Relationships to Work and Other Activities.

c. **Specific Physical Exam Findings may include**:

i. Partial -Thickness Tear:

A) There may be pain at the end of 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.9. Impingement Syndrome.

ii. 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, biceps tendon ruptures, and calcific tendinitis. In older patients, tears may co-exist 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.

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. Axillary view identifies dislocations and humeral head deficits (Hill-Sachs lesion) and is useful to demonstrate arthritis and spurs on the anterior inferior acromion;

iii. 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 (Hirano, 2002).

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 an appropriate shoulder rehabilitation program. 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 (Dinnes, 2003 [Health Technology Assessment]).

Rotator cuff tears, both full-thickness and partial, appear to occur commonly in asymptomatic individuals. MRI diagnostic criteria for full rotator cuff tear may be met in approximately 28% of asymptomatic persons, and in asymptomatic persons over age 60, contralateral rotator cuff tears may occur in approximately 35% (Sher, 1995). 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. A small minority of patients younger than age 40 demonstrate these changes. Correlation of radiological and clinical findings is an important part of patient management (Reilly, 2006; Sher, 1995; Milgrom, 1995).

There is good evidence that MRI, MRA, and US are all accurate at identifying full thickness rotator cuff tears in patients whose history and physical examination makes them candidates for possible surgery. There is no evidence to suggest that any of the three is superior for this purpose. There is inadequate evidence regarding the comparative accuracy for diagnosing partial thickness tears. Available studies utilize clinically very different categories which lead to equivocal interpretation of the findings ([Cochrane] Lenza, 2013b).

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

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

ii. There is some evidence that intra-articular triamcinolone provides pain relief for up to 3 months in elderly patients with full thickness rotator cuff tears, and that a single injection is likely to be as beneficial as two injections (Gialanella, 2011).

iii. There is some evidence that in the setting of supraspinatus tendinosis or partial thickness tears less than 1 cm in size, either dry needling or an injection of 3 ml of platelet-rich plasma (PRP) have clinical benefits lasting up to 6 months, and that the benefits of PRP appear to be greater than those for dry needling (Rha, 2013). Dry needling has not been proven to be an efficacious therapy for supraspinatus tendinitis.

There is good evidence that in the setting of rotator cuff tendinopathy, a

single dose of PRP provides no additional benefit over saline injection when the patients are enrolled in a program of active physical therapy (Kesikburun, 2013).

There is strong evidence that platelet rich therapy does not show a clinically important treatment effect for shoulder pain or function when given as an adjunct to arthroscopic rotator cuff repair. However, at present, there is also a lack of standardization of platelet preparation methods, which precludes clear conclusions about the effect of platelet-rich therapies for musculoskeletal soft tissue injuries ([Cochrane] Moraes, 2013; Gumina, 2012a; Lee, 2012b; Mall, 2014). Therefore, PRP is *not generally recommended* except under specific circumstances. Refer to Section F. 4, b., Platelet-Rich Plasma.

iv.   Relative rest initially and procedures outlined in Section F. Therapeutic Procedures - Non-operative. Therapeutic rehabilitation interventions may include ROM and use of 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 neuromuscular re-education of shoulder girdle musculature. Maladaptive compensatory strain patterns should always be addressed.

There is some evidence that in patients over 55 with nontraumatic small tears of the supraspinatus tendon, an intervention of home exercise supervised by a shoulder-trained physiotherapist, may be as beneficial at one year as the same physiotherapy program initiated after acromioplasty or acromioplasty with repair of the rotator cuff (Kukkonen, 2014).

v.   Return to work with appropriate restrictions should be considered early in the course of treatment. Refer to Section F.13. Return to Work. The injured worker should adhere to the written work restrictions not only in the workplace, but at home and for 24 hours per day.

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

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.

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 are uncommon in the 40-60 age groups (Sher, 1995). About 25%of asymptomatic patients over 60 will have a full thickness tear (Sher, 1995). Full- thickness tears greater than 1 cm, in individuals less than 60 should generally be repaired (Tashjian, 2012). Smaller tears appear to show less likelihood of progression (25%) (Fucentese, 2012). Only about 10 percent of partial tears increase in size over time (Maman, 2009).The recovery rate for those with a full thickness tear without surgery is 60% (Galatz, 2001; Wolf, 2004; Goldberg, 2001; Hawkins, 1995). 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. For patients with lack of active elevation above 90 degrees, arthroscopic biceps tenotomy may be effective in returning some elevation. The recurrence rate may be up to 50% in older patients with multiple tendon full-thickness tears (Harryman, 1991). Pseudo paralysis or severe rotator cuff arthropathy are contraindications to the procedure.

Failure of healing after a rotator cuff tear (RCT) repair is not uncommon with a re-tear rate of about 30% and a re-operative rate of 20%. Those with intact tendon repairs had a re-operative rate at 7 years of 5% due to impingement (Kluger, 2011). Success rates as high as 90% have been reported in some centers (Wolf 2004, Galatz 2001), but these may not represent all patients undergoing rotator cuff repair. Grade 2 fatty infiltration and age (over 65) are both associated with worse outcomes, forty-three percent healed repair versus 86% (Liem, 2007).

Another factor with prognostic significance is supraspinatus atrophy. Thomazeau 1996 used an oblique-sagittal MRI view of the supraspinatus fossa to estimate the degree of atrophy of the muscle belly in relation to the fossa, classifying the results into three classes. Stage I was considered normal or only slightly atrophied, with the muscle filling 60% or more of the supraspinatus fossa. Stage II, moderate atrophy, filled 40-60% of the fossa, and Stage III, severe atrophy, filled less than 40% of the fossa. Liem 2007 used a slightly modified version of the Thomazeau classification of supraspinatus atrophy, comparing the rates of retear between Stage I and Stage II. There were 35 cases with Stage I, with 5 re-tears (14%). There were 10 cases with Stage II atrophy, with 5 re-tears (50%). The degree of supraspinatus atrophy on the preoperative MRI is likely to predict the probability of a retear after arthroscopic rotator cuff repair.

Early repair is suggested for acute full thickness tears greater than 1 cm. If age is greater than 65 an appropriate shoulder rehabilitation program should be implemented for 6 to 8 weeks before surgery (Tashjian, 2012). Partial thickness tears and full thickness tears less than 1 cm are treated non-operatively initially (Tashjian, 2012).

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

i. Related Evidence:

There is some evidence that in patients over 55 with nontraumatic small tears of the supraspinatus tendon, an intervention of home exercise supervised by a shoulder-trained physiotherapist may be as beneficial at one year as the same physiotherapy program initiated after acromioplasty or acromioplasty with repair of the rotator cuff (Kukkonen, 2014).

There is good evidence that symptomatic full thickness rotator cuff tears less than 3 cm in size receive more benefit from surgical intervention than from physical therapy one year after the injury (Moosmayer, 2010).

There is some evidence that in patients with reparable full-thickness rotator cuff tears and a Type II acromion, there are no appreciable differences in pain and shoulder function between rotator cuff repairs done with and without subacromial decompression up to one year after surgery (Gartsman, 2004).

g. **Operative Procedures**:

Options would include arthroscopic or open debridement and/or repair.

Routine acromioplasty is *not recommended* (Chahal, 2012a).

Tenodesis is a more complex procedure and requires more time off work compared to tenotomy and is *not generally recommended*.

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 (Barber, 2006; Fischer, 1999).

Distal clavicular resection is *not recommended* for patients without AC joint pain (Industrial Insurance Medical Advisory Committee (IIMAC), 2013). This should only be performed on patients with reproducible pain at the AC joint which is relieved with a local anesthetic injection.

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 (Speed, 2006 [BMJ Clinical Evidence]).

Use of porcine submucosa grafts are *not recommended* due to a high failure rate (Smith, 2012a; American Academy of Orthopaedic Surgeons (AAOS), 2010).

Platelet-rich plasma therapy is *not recommended* due to lack of evidence ([Cochrane], Moraes, 2013).

Acellular dermal matrix augmentation of rotator cuff tears larger than 3 cm and less than 5 cm require prior authorization.

Continuous interscalene blocks (ISB) are *not recommended*. For more information, please refer to Section G.7. Interscalene Anesthesia.

Continuous subacromial infusion are *not recommended*, refer to Section G.8. Continuous Subacromial Anesthesia Injection, for more information.

i.   Related Evidence:

There is some evidence that interscalene regional blocks (ISB) at the time of elective arthroscopic rotator cuff repair results in faster hospital discharge than general anesthesia, therefore ISB is recommended. There is some evidence that continuous ISB for 48 hours is associated with somewhat greater pain relief at the seventh postoperative day than single injection ISB, but there is little if any difference in the use of opioids at that time between continuous and single injection anesthesia (Salviz, 2013). Therefore, continuous ISB is *not recommended*.

There is some evidence that in the setting of arthroscopic rotator cuff repair, a subacromial infusion of 4 ml/hour of 0.5% bupivacaine for 50 hours does not reduce post-operative pain or oxycodone consumption in a clinically meaningful way (Schwartzberg, 2013). Therefore, it is *not recommended*.

There is good evidence that in the setting of surgical repair of full thickness rotator cuff tears, routine acromioplasty does not improve the outcome of surgery compared to cuff repair alone (Chahal, 2012a).

There is some evidence, with data pooled from two studies, that reoperations are done less often in the two years following surgery when an acromioplasty is included as part of the arthroscopic rotator cuff repair

operation (Abrams, 2014; MacDonald, 2011). It is unknown to what extent the second surgery increased function.

An additional study provided some evidence that patient-reported pain and function does not differ greatly when acromioplasty is either done or not done in the setting of full thickness rotator cuff tears repaired arthroscopically. There is inadequate evidence that physician-measured outcomes are equivalent for the two operations (Abrams, 2014).

There is good evidence that in the setting of arthroscopic repair of full-thickness rotator cuff tears, two-year patient-reported outcomes are similar with and without acromioplasty (MacDonald, 2011).

There is strong evidence that platelet rich therapy does not show a clinically important treatment effect for shoulder pain or function when given as an adjunct to arthroscopic rotator cuff repair. However, at present, there is also a lack of standardization of platelet preparation methods, which precludes clear conclusions about the effect of platelet-rich therapies for musculoskeletal soft tissue injuries ([Cochrane] Moraes, 2013). Therefore it is *not recommended*.

There is some evidence that acellular dermal matrix augmentation of reparable rotator cuff tears larger than 3 cm but less than 5 cm may improve tendon repair and reduce the rate of recurrent rotator cuff tears in the first 12 to 24 months after surgery, provided that the patients are nonsmokers (Barber, 2012). This may be allowed with prior authorization.

There is good evidence that arthroscopic and open rotator cuff surgery do not differ in long-term outcome results. There is a lack of evidence about the comparative effectiveness of surgery and active PT for supraspinatous syndrome (Gebremariam, 2011).

There is good evidence that symptomatic full thickness rotator cuff tears less than 3 cm in size, in the absence of severe supraspinatus atrophy, receive more benefit from arthroscopic tendon repair than from physical therapy at 12 months (Moosmayer, 2010).

There is some evidence that in the setting of full thickness rotator cuff tears smaller than 3 cm in the longest direction and in the absence of acromial spurs, acromioplasty with cuff repair does not improve the 2 year pain and functional outcomes compared to cuff repair alone (Shin, 2012).

There is some evidence that in the setting of repairable rotator cuff tears with lesions of the long head of the biceps, there is little difference in functional outcome at two years between tenotomy and tenotomy accompanied by tenodesis (De Carli, 2012). Because tenodesis is a more complex procedure and requires more time off work, it is *generally not recommended*.

There is good evidence that in patients over 55 with reparable rotator cuff tears and lesions of the long head of the biceps, tenotomy and tenodesis at the intertubercular groove provide equal functional and symptomatic benefits two years after surgery (Zhang, 2013).

There is some evidence that in patients over 50 who have both rotator cuff repairs and Type II SLAP lesions, the outcomes of a tenotomy of the long head of the biceps are at least as good as those of repairing the SLAP lesion, and the operating time is likely to be shorter (Franceschi, 2008).

There is some evidence that in patients over 60 with symptomatic rotator cuff tears, repair of the tear at the time of acromioplasty/tenotomy leads to better function at one year than acromioplasty/tenotomy alone (Dezaly, 2011).

h. **Post-operative Treatment**:

An individualized rehabilitation program will be 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. There is inadequate evidence for the addition of continuous passive motion exercise to a standard physiotherapy rehabilitation program of passive self-assisted range of motion exercises after arthroscopic rotator cuff repair as this study did not provide baseline data (Garofalo, 2010). Continuous passive motion is *not generally recommended*. It may be used if the patient has no home assistance to regularly perform the passive motion required in the first 6 weeks and/or access to therapy is limited (Seida, 2010; Garofalo, 2010).

iv. Isometrics and activity of daily living skills usually begin at 6 weeks post-operatively.

v. Active assisted range-of-motion exercises in supine with progression to sitting, timing based on surgeon's discretion;

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

vii. Pool exercise initially under therapists or surgeon's direction, then progressed to independent pool program;

viii. Progression to a home exercise program is essential;

ix. Gradual resistive exercise from 3 to 4 months, with gradual return to full activity at 6 months;

x. Time frames for all post-operative therapy (excluding aquatic therapy).

❖ Optimum: 24 sessions.

❖ Maximum: 36 sessions. If functional gains are being achieved, additional visits may be authorized for the patient to achieve their functional goal.

xi. If progress plateaus, 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. Nutritional supplements are generally not covered under Workers' Compensation. One study showed no evidence of functional gains after surgery using a specific proprietary supplement (Gumina, 2012b).

xiii. 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day. 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. Recovery to full duty in most cases is by 6 months.

xiv. Related Evidence:

There is some evidence that a postoperative rehabilitation protocol of early or delayed initiation of passive range of motion exercises demonstrate very similar clinical outcomes and range of motion at 1-year after arthroscopic repair of a full-thickness supraspinatus tear, indicating no significant advantage to beginning early passive ROM after surgery. Patients in the delayed range of motion group had a slightly higher rotator cuff healing rate per ultrasound imaging (91% vs. 85%). However, there was no statistically significant difference. It is possible that there is a potential benefit to delaying passive ROM in an effort to protect the surgical repair (Cuff, 2012b).

There is some evidence that aggressive early passive rehabilitation consisting of passive shoulder stretching and manual therapy without range of motion limits yields faster recovery of range of motion at 3

months after arthroscopic single-row rotator cuff repair than limited early passive rehabilitation, but after 12 months postoperatively, no differences in range of motion were found between the 2 groups. The re-tear rate of the aggressive early passive rehabilitation group was more than twice the rate of the limited early passive rehabilitation group (Lee, 2012a).

11. SHOULDER INSTABILITY/GLENOHUMERAL INSTABILITY:

a. Description/Definition:

Subluxation (partial dislocation), or dislocation of the glenohumeral joint in either an anterior, inferior, 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" (apprehension); or

- Feeling of shoulder weakness.

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 a baseball;

- A significant traction injury to the arm.

Posterior dislocations are uncommon. They 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.

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).

c. 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; and the pain is always severe.

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

iii. Posterior dislocations - Patients present with inability to externally rotate the shoulder;

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 and multiple joints, who have similar 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 Fegin.

- Relocation.

- Load and shift or anterior and posterior drawer.

d. **Diagnostic Testing Procedures**:

i. Plain x-rays to rule out bony deficit of 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.

ii. More difficult diagnostic cases with subtle history and physical findings suggesting instability, rotator cuff or labral tear, may require an MRI, MRA or a CT arthrogram. There is good evidence that MRA is marginally

more sensitive and specific for the detection of many glenohumeral labral lesions, including SLAP lesions (Smith, 2012c). This is especially true with a 1.5 Tesla scanner. 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.

iii.   For suspected rotator cuff tear cases, refer to Section E.9. Rotator Cuff Tear.

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 (Robinson, 2002). 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 (Chalidis, 2007). 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 (Chalidis, 2007). An MRI study showed that with the arm in internal rotation, the joint cavity anterior to the glenoid is wide open, and this cavity closes when the arm is externally rotated, placing the labrum next to the glenoid rim (Itoi, 2001). Overall, there is some evidence that bracing of dislocations in external rotation with closed reductions reduce the risk of recurrent dislocation, compared to bracing in internal rotation (Combined analysis of Finestone, 2009; Itoi, 2007). 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. There is some evidence that open Bankart repair of first time anterior shoulder dislocation reduces the risk of redislocation for up to ten years, and that the risk of recurrence is greatest in younger patients age 15 to 24 (Jakobsen, 2007). There is good evidence that in active young persons engaged in physical activities, a first anterior shoulder dislocation treated surgically is less likely to redislocate than a dislocation treated with sling immobilization

only ([Cochrane] Handoll, 2004). 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.7.).

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). There is a lack of evidence to inform other specific treatment decisions (Handoll, 2006).

E)   Additional treatment may include, depending on level of improvement, osteopathic manipulative medicine, 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.13. Return to Work.

The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

ii.   Acute or chronic dislocations: with a fracture contributing to instability;

Practitioners should reduce and immobilize dislocations if in an acceptable position. Consultation should be obtained as soon as possible, because 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 and there are findings of instability, operative repair should be considered.

iv.   Posterior dislocation: Posterior shoulder dislocations are quite rare, and are less than 5% of shoulder dislocations.

Usual treatment after reduction includes bracing for at least 6 weeks in neutral or external rotation. Non-operative treatment is suggested for older patients with low physical demands, those with no posterior

instability or with less than 10% defect of the humeral head. Reverse Hill-Sachs lesions, posterior Bankart lesions, and fractures of the surgical neck of the humerus are all relatively common (Rouleau, 2012). In patients with humeral head defects involving 10-40% of the articular surface, biologic reconstruction with allograft or autograft are appropriate treatment options. If the defect covers 45% or more of the articular surface, total shoulder arthroplasty may be necessary (Paul, 2011). Instability in the first year for posterior dislocations is usually around 18% (Robinson, 2011). Patients older than 50 may have rotator cuff lesions amenable to physical therapy (Robinson, 2011). Patients should be assessed for hyper-mobility or ability to sublux at will. They may require muscle retraining to correct (Jaggi, 2010). Patients with posterior dislocations are likely to have limited internal rotation after treatment (Robinson, 2011).

v.   Brachial plexus injury, dislocation, and rotator cuff tear – the "terrible triad":

Patients over 40 are more likely to suffer this entity and should be evaluated by an orthopedic surgeon if there is continual difficulty with abduction (Murthi, 2012).

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 good evidence that in active young persons engaged in physical activities, a first anterior shoulder dislocation treated surgically is less likely to redislocate than a dislocation treated with sling immobilization only ([Cochrane] Handoll, 2004). There is strong evidence that in the setting of first-time traumatic shoulder dislocation in patients aged between 16 and 40, surgical Bankart repair more effectively prevents later recurrence of instability than more conservative treatment, and some evidence that the effects of Bankart repair are likely to last for five years or longer (Chahal, 2012b).

A study describing long-term arthropathy after initial anterior dislocation found more moderate / severe cases in patients who were aged 26-33 at first dislocation and less moderate / severe arthropathy in those with no recurrence or who were initially surgically addressed (Hovelius, 2009).

Consider surgical intervention for young patients active in sports, or older patients with significant rotator cuff tears. There is some evidence that open Bankart repair of first time anterior shoulder dislocation reduces the risk of redislocation for up to ten years, and that the risk of recurrence is greatest in younger patients age 15 to 24 (Jakobsen, 2007). One systematic review reported a risk of instability at 10 years of between 34% and 35%. Risk factors were age below 22 years old, male gender, the number of preoperative dislocations and participation in competitive sports (Randelli, 2012). If additional pathology is present, consult appropriate diagnostic categories.

Those with Hill-Sachs lesions, bony Bankart injuries, or significant glenoid bone loss have a worse prognosis for recurrences. In one study of cost effectiveness, primary arthroscopic stabilization for first time dislocations in 15 year old and 25 year old men was cost effective. It was effective but costly for 25 year old women and 35 year old men (Crall, 2012).

Fractures not amenable to immobilization and/or with 1 cm displacement may also need operative management after the first dislocation (Smith, 2013). Even with open repairs, some decrease in function should be expected. Loss of external rotation is common (DiSilvestro, 2007). In some cases the loss of motion may have an adverse effect on post-operative function. The decision for surgery should carefully consider the desire to prevent recurrent dislocations and the need for full ROM.

Older patients with documented large rotator cuff tears should also be considered for operative repair after first time dislocations (Smith, 2013). Repair of the rotator cuff tear alone or in combination with stabilization should be considered. Refer to Section E.10. Rotator Cuff Tear.

In general, older patients without the above lesions will suffer few recurrences, and, therefore, are treated conservatively. Operative repair may be considered 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. For anterior dislocations there may be limitation in external rotation. Patients with multi-directional laxity and/or laxity in the contralateral shoulder are usually not good candidates for operative repair.

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

Specific Indications:

- Dislocation with a fracture not amenable to immobilization such as those with 1 cm displacement;

- First time dislocations in younger patients up to age 40, and those less than 60 who perform lifting and overhead work;

- Repeat dislocations when not accompanied by multiple joint laxity.

g. **Operative Procedures**:

i. Bankart lesion repair; or

ii. Capsular tightening. There is no evidence of benefit from thermal capsulorrhaphy and it is *not recommended* (D'Alessandro, 2004; Chen, 2005);

iii. Bony block transfer; e.g. Laterjet procedure.

iv. Additional surgery, such as SLAP repair or rotator cuff repair as indicated in the specific diagnostic sections.

Continuous interscalene blocks (ISB) are *not recommended*. For more information, please refer to Section G.7. Interscalene Anesthesia.

h. **Post-operative Treatment**:

i. 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, therapeutic exercise should begin. An individualized rehabilitation program will be based upon communication between the surgeon and the therapist. Aquatic therapy may be beneficial. The optimum number of treatments is 16-25 (Di Paola, 2013). 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day. 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.

12. SUPERIOR LABRUM ANTERIOR AND POSTERIOR (SLAP) LESIONS:

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.

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

ii. 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. Type II lesions do not commonly require surgical repair.

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

iv. Type IV is a bucket handle tear as in Type III, but with extension of the tear into 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.

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. 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 ([Morgan,1998](#)); 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. For details refer to Section C.2 Relationships to Work and Other Activities.

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 lesions. 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. A combination of test results usually assists in diagnosis. The most common test are listed below, however other physical exam maneuvers may be used. Refer to Section C. 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.

d. **Diagnostic Testing Procedures**:

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

ii. 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. (Pfahler, 2003). One retrospective study found that a negative MRI had a only a 5% chance of being a SLAP lesion (Sheridan 2014).

iii.   Arthroscopic evaluation is the most definitive diagnostic test.

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.7. Medications.)

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

iii.   Benefits may be achieved through therapeutic rehabilitation and rehabilitation 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 neuromuscular re-education of the shoulder girdle musculature. Three months of conservative management is recommended for cases not qualifying for surgery due to other indications. Therapy should be directed at scapular dyskinesis and rotator cuff imbalance with closed and open chain exercises. Stretching of posterior capsule with the sleeper stretch may be helpful (shoulder flexion to 90 degrees, adduction, and internal rotation). This may be followed by core and trunk strengthening (McCormick, 2014). Maladaptive compensatory strain patterns should always be addressed. (Refer to Section F. Therapeutic Procedures - Non-operative.)

iv.   Subacromial bursal and/or glenohumeral steroid injections can decrease inflammation and allow the therapist to progress with functional exercise and ROM. For more information on steroid injections, please refer to Section F.4.d. Shoulder Joint Steroid Injections.

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

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

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. Given the total available evidence at this time, SLAP repair is most likely to improve outcomes for those under 35, laborers who need supination strength, or those with current instability. Therefore, when the below indications are met, an arthroscopy can be performed with appropriate surgical repair.

Arthroscopic SLAP repair is usually **not recommended** in cases of severe arthritis. The rotator cuff should generally be intact or repairable. In one study overall total shoulder arthroplasty success was good with an 85% 15-20 year survival rate (Killian, 2012). Another study reported secondary rotator cuff dysfunction at initially low levels but increasing to 55% at 15 years (Young, 2012).

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 an appropriate shoulder rehabilitation program 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) an appropriate shoulder rehabilitation program is an acceptable option and that 2) a potential complication of the surgery is shoulder stiffness with pain and possibly decreased function.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed

decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

g.   **Operative Procedures**:

Operative treatment of SLAP lesions depends on the type of lesion present and whether any other intra-articular abnormalities are present. A five-year follow-up of patients over 40 years old with an isolated Type II SLAP repair, found high patient satisfaction and improvement in the Rowe score for function and disability (Schroder, 2012). One case series reported better return to sports for younger patients with an isolated Type II SLAP, who had a biceps tenodesis versus a more classic repair (Boileau, 2009). Overall results from both an anchor SLAP repair and biceps tenodesis are good with long-term follow up of demonstrating around 80% good results and about 70% or greater return to athletic overhead activities (Denard, 2012; Ek, 2014; Neuman, 2011). However, patients 40 and older were less likely to do well with a SLAP repair and more likely to have a biceps tenodesis (Denard, 2012; Ek, 2014; Provencher, 2013). Advantages of a biceps tenodesis are shorter recovery time with return to work in 6 – 8 weeks and possible better outcome for those who participate in overhead throwing activities. Biceps tenodesis may be considered for those over 40 years of age, for revision surgery and those with glenohumeral arthritis (Werner, 2013; McCormick, 2014). Tenotomy appears to have equally reliable results with a shorter recovery time of 2 weeks and should be an additional option, especially for those with a rotator cuff tear (Gill, 2001; De Carli, 2012; McCormick, 2014). The following are generally accepted protocols for surgical intervention; however, due to current lack of evidence, operative treatment is not limited to these.

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

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

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

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

Continuous interscalene blocks (ISB) are *not recommended*. For more information, please refer to Section G.7. Interscalene Anesthesia.

h.   <u>**Complications**</u>:

SLAP repair usually results in some permanent range of motion deficits and may limit ability to participate in overhead competitive sports. Other complications may include anchor failure and suprascapular nerve damage. In one series, over 30% had revision surgery (Provencher, 2013). Biceps tenodesis is less likely to have complications, frequently less than 3% (McCormick, 2014).

i.   <u>**Post-operative Treatment**</u>:

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 3 to 6 weeks. Elbow, wrist, and hand ROM exercises may be used at this time. The sling is removed at 3 to 4 weeks and active ROM is usually begun with restrictions directed by the surgeon. Active biceps exercise may be restricted for 12 weeks. Biceps tenodesis patients require fewer restrictions and may frequently return to full duty at 6 – 8 weeks (McCormick, 2014).

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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day. Most patients will be able to return to full duty by seven months.

F.   THERAPEUTIC PROCEDURES — NON-OPERATIVE

Before initiation of any therapeutic procedure, the authorized treating provider, employer, and insurer must consider these four 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 F.12. Return to Work 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 patient education. Functional progression is expected through prescribed activity such as neuromuscular and postural re-education/re-patterning exercises. Before diagnostic tests or referrals for invasive treatment take place, the patient should be able to clearly articulate the goals of the intervention, the general side effects and associated risks, and the patient's agreement with the expected treatment plan.

Last, 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.

Home therapy is an important component of therapy and may include active and passive therapeutic procedures as well as other modalities to assist in alleviating pain, swelling, and abnormal muscle tone.

The following procedures are listed in alphabetical order.

1.   **ACUPUNCTURE** When acupuncture has been studied in randomized clinical trials, it is often compared with sham acupuncture and/or no acupuncture (usual care). The differences between true acupuncture and usual care have been moderate, but clinically important. These differences can be partitioned into two components: non-specific effects and specific effects. Non-specific effects include patient beliefs and expectations, attention from the acupuncturist, administration of acupuncture in a relaxing setting, and other components of what is often called the placebo effect. Specific effects refer to any additional effects which occur in the same setting of expectations and attention, but they are attributable to the penetration of the skin in the specific, classic acupuncture points on the surface of the body by the needles themselves.

A sham procedure is a non-therapeutic procedure that appears similar to the patient as the purported therapeutic procedure being tested. In most controlled studies, sham and classic acupuncture have produced similar effects. However, the sham controlled studies have shown consistent advantages of both true and sham acupuncture over no acupuncture when the studies have included a third comparison group that was randomized to usual medical care. Having this third comparison group has been advantageous in the interpretation of the non-specific effects of acupuncture, since the third comparison group controls for some influences on study outcome. These influences

include more frequent contact with providers, the natural history of the condition, regression to the mean, the effect of being observed in a clinical trial, and, if the follow-up observations are done consistently in all three treatment groups, for biased reporting of outcomes. Controlling for these factors enables researchers to more closely estimate the contextual and personal interactive effects of acupuncture as it is generally practiced.

Because the sham acupuncture interventions in the clinical trials are generally done by trained acupuncturists, and not by totally untrained personnel, the sham acupuncture interventions may include some of the effects of true acupuncture (Dincer, 2003), much as a partial agonist of a drug may produce some of the effects of the actual drug. For example, a sham procedure involving toothpicks rather than acupuncture needles may stimulate cutaneous afferents in spite of not penetrating the skin, much as a neurological sensory examination may test nociceptor function without skin penetration. To the extent that afferent stimulation is part of the mechanism of action of acupuncture, interpreting the sham results as purely a control group would lead to an underestimation of the analgesic effects of acupuncture. Thus we consider in our analysis that "sham" or non-classic acupuncture may have a positive clinical effect when compared to usual care.

Clinical trials of acupuncture typically enroll participants who are interested in acupuncture, and who may respond to some of the non-specific aspects of the intervention more than would be expected of patients who have no interest in or desire for acupuncture. The non-specific effects of acupuncture may not be produced in patients who have no wish to be referred for it.

Another study provides good evidence that true acupuncture at traditional medians is marginally better than sham acupuncture with blunt needles in reducing pain, but effects on disability are unclear (Cho, 2013). In these studies 5–15 treatments were provided. Comparisons of acupuncture and sham acupuncture have been inconsistent, and the advantage of true over sham acupuncture has been small in relation to the advantage of sham over no acupuncture.

Acupuncture is recommended for subacute or chronic pain patients who are trying to increase function and/or decrease medication usage and have an expressed interest in this modality. It is also recommended for subacute or acute pain for patients who cannot tolerate NSAIDs or other medications.

Acupuncture is not the same procedure as dry needling for coding purposes; however, some acupuncturists may use acupuncture treatment for myofascial trigger points. Dry needling is performed specifically on myofascial trigger points. Refer to F.4.h. Trigger Point Injections and Dry Needling Treatment.

Acupuncture should generally be used in conjunction with manipulative and physical therapy/rehabilitation.

Credentialed practitioners with experience in evaluation and treatment of chronic pain patients must perform acupuncture evaluations prior to acupuncture treatments. The exact mode of action is only partially understood. Western medicine studies suggest that acupuncture stimulates the nervous system at the level of the brain, promotes deep relaxation, and affects the release of neurotransmitters. Acupuncture is commonly used as an alternative or in addition to traditional Western pharmaceuticals. It may be used

when pain medication is reduced or not tolerated; as an adjunct to physical rehabilitation and surgical intervention; and/or as part of multidisciplinary treatment to hasten the return of functional activity. Acupuncture must be performed by practitioners with the appropriate credentials in accordance with state and other applicable regulations. Therefore, if not otherwise within their professional scope of practice and licensure, those performing acupuncture must have the appropriate credentials, such as L.A.c. R.A.c, or Dipl. Ac.

There is some evidence that both subacromial corticosteroid injection and a series of 10 acupuncture treatments combined with home exercises significantly decreased pain and improved shoulder function in patients with subacromial impingement syndrome, but neither treatment was significantly superior to the other (Johansson, 2011).

a. **Acupuncture**: is the insertion and removal of filiform needles to stimulate acupoints (acupuncture points). Needles may be inserted, manipulated, and retained for a period of time. Acupuncture can be used to reduce pain, reduce inflammation, increase blood flow, increase range of motion, decrease the side effect of medication-induced nausea, promote relaxation in an anxious patient, and reduce muscle spasm.

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

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

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

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

❖ Time to Produce Effect: 3 to 6 treatments.

❖ Frequency: 1 to 3 times per week.

❖ Optimum Duration: 1 to 2 months.

❖ Maximum Duration: 15 treatments.

Any of the above acupuncture treatments may extend longer if objective functional gains can be documented and 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 and functional gains. Such care should be re-evaluated and documented with each series of treatments.

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

    2.   **BIOFEEDBACK:** 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. Stress-related psycho-physiological reactions may arise as a reaction to organic pain and in some cases may cause pain. 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. There is good evidence that biofeedback or relaxation therapy is equal in effect to cognitive behavioral therapy for chronic low back pain (Hoffman, 2007).

Indications for biofeedback include cases of 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 pain, anxiety, panic, anger or emotional distress, opioid withdrawal, insomnia/sleep disturbance, and other central and autonomic nervous system imbalances. Biofeedback is often utilized for relaxation training. Mental health professionals may also utilize it as a component of psychotherapy, where biofeedback and other behavioral techniques are integrated with psychotherapeutic interventions. Biofeedback is often used in conjunction with physical therapy or medical treatment.

Recognized types of biofeedback include the following:

a.   **Electromyogram (EMG):** Used for self-management of pain and stress reactions involving muscle tension.

b.   **Skin Temperature:** Used for self-management of pain and stress reactions, especially vascular headaches.

c.   **Respiration Feedback (RFB):** Used for self-management of pain and stress reactions via breathing control.

d.   **Respiratory Sinus Arrhythmia (RSA):** Used for self-management of pain and stress reactions via synchronous control of heart rate and respiration. Respiratory sinus arrhythmia is a benign phenomenon that consists of a small rise in heart rate during inhalation, and a corresponding decrease during

exhalation. This phenomenon has been observed in meditators and athletes, and is thought to be a psycho-physiological indicator of health.

e. **Heart Rate Variability (HRV):** Used for self-management of stress via managing cardiac reactivity.

f. **Electrodermal Response (EDR):** Used for self-management of stress involving palmar sweating or galvanic skin response.

g. **Electroencephalograph (EEG, QEEG):** Used for self-management of various psychological states by controlling brainwaves.

The 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 should be motivated to learn and practice biofeedback and self-regulation techniques. In the course of biofeedback treatment, patient stressors are discussed and self-management strategies are devised. If the patient has not been previously evaluated, a psychological evaluation should be performed prior to beginning biofeedback treatment for chronic pain. The psychological evaluation may reveal cognitive difficulties, belief system conflicts, somatic delusions, secondary gain issues, hypochondriasis, and possible biases in patient self-reports, which can affect biofeedback. Home practice of skills is often helpful for mastery and may be facilitated by the use of home training tapes.

Psychologists or psychiatrists who provide psycho-physiological therapy, which integrates biofeedback with psychotherapy, should be either Biofeedback Certification International Alliance (BCIA) certified or practicing within the scope of their training. All non-licensed health care providers of biofeedback for chronic pain patients must be BCIA certified and shall have their biofeedback treatment plan approved by the authorized treating psychologist or psychiatrist. Biofeedback treatment must be done in conjunction with the patient's psychosocial intervention. Biofeedback may also be provided by health care providers who follow a set treatment and educational protocol. Such treatment may utilize standardized material or relaxation tapes.

Coordination between the biofeedback provider and the other health care providers is strongly encouraged.

❖ Time to Produce Effect: 3 to 4 sessions.

❖ Frequency: 1 to 2 times per week.

❖ Optimum Duration: 6 to 8 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 and functional gains.

3. **EXTRACORPOREAL SHOCK WAVE THERAPY (ESWT) AND RADIAL SHOCK WAVE THERAPY:** is used to increase function and decrease pain in patients with specified

types of calcific tendinitis who have failed conservative therapy. It is not a first line of 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. There is some evidence that low energy radial shock wave therapy may be beneficial in the setting of calcific tendinitis (Cacchio, 2006). This technique is less painful than high energy ESWT and can be specifically directed. There is also good evidence that both high energy and low energy ESWT may provide functional benefits in the setting of calcific tendinitis, and may reduce the size of the calcific deposits and reduce pain (Gerdesmeyer, 2003; Pan, 2003). 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*** (Schmitt, 2001). Neither anesthesia nor conscious sedation is required nor is it recommended for this procedure. There is no evidence that results with fluoroscopic guidance (Haake, 2002) or with computer-assisted navigation (Sabeti–Aschraf, 2005) are superior to results obtained by palpation. These are ***not recommended***.

Indications - patients with calcific tendinitis 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.

4. INJECTIONS-THERAPEUTIC:

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.

Caution should be used when ordering four or more steroid injections total for all anatomic sites in one year. Please refer to Section F.4.d. Shoulder Joint Steroid Injections.

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.

<u>a.</u> **<u>Botulinum Toxin Injections</u>**: Description – Used to temporarily weaken or paralyze muscles. May reduce muscle pain in conditions associated with spasticity, dystonia, or other types of painful muscle spasm. Neutralizing antibodies develop in at least 4% of patients treated with botulinum toxin type A, rendering it ineffective. Several antigenic types of botulinum toxin have been described. Botulinum toxin type B, first approved by the Food and Drug Administration (FDA) in 2001, is similar pharmacologically to botulinum toxin type A. It appears to be effective in patients who have become resistant to the type A toxin. The immune responses to botulinum toxins type A and B are not cross-reactive, allowing type B toxin to be used when type A action is blocked by antibody. Experimental work with healthy human volunteers suggests that muscle paralysis from type B toxin is not as complete or as long lasting as that resulting from type A. The duration of treatment effect of botulinum toxin type B for cervical dystonia has been estimated to be 12 to 16 weeks. EMG needle guidance may permit more precise delivery of botulinum toxin to the target area.

There is strong evidence that botulinum toxin A has objective and symptomatic benefits over placebo for cervical dystonia ([Cochrane] Costa, 2005).

There is some evidence that in patients with subacromial bursitis or subacromial impingement syndrome, a single ultrasound-guided subacromial injection of botulinum toxin B may be more effective than a steroid injection in pain reduction and shoulder function 3 months after the injection, but the usefulness of repeated botulinum injections is not known (Lee, 2011b).

Indications – For conditions which produce cervical dystonia, bursitis, or impingement. There should be evidence of limited range-of-motion prior to the injection.

There is insufficient evidence to support its use for other myofascial trigger points for longer-term pain relief and it is likely to cause muscle weakness or atrophy if used repeatedly (Ferrante, 2005; Gobel, 2006; Porta, 2000). Examples of such consequences include subacromial impingement, as the stabilizers of the shoulder are weakened by repeated injections of trigger points in the upper trapezii (Abbott 2007). Therefore it is ***not recommended*** for use for other myofascial trigger points.

Complications – There is good evidence that cervical botulinum toxin A injections cause transient dysphagia and neck weakness. Allergic reaction to medications, dry mouth and vocal hoarseness may also occur ([Cochrane] Costa, 2005). Rare systemic effects include flu-like syndrome, and weakening of distant muscle.

There is an increased risk of systemic effects in patients with motor neuropathy or disorders of the neuromuscular junction.

❖ Time to Produce Effect: 24 to 72 hours post injection with peak effect by 4 to 6 weeks.

❖ Frequency: No less than 3 months between re-administration. Patients should be reassessed after each injection session for an 80% improvement in pain (as measured by accepted pain scales) and evidence of functional improvement for 3 months. A positive result would include a return to base line function, return to increased work duties, and measurable improvement in physical activity goals including return to baseline after an exacerbation.

❖ Optimum Duration: 3 to 4 months.

❖ Maximum Duration: 1 time. Prior authorization is required for additional injections. Repeat injections should be based upon functional improvement and therefore used sparingly in order to avoid development of antibodies that might render future injections ineffective. In most cases, not more than four injections are appropriate due to accompanying muscle atrophy.

b. **Platelet Rich Plasma (PRP)**: There is some evidence that in the setting of supraspinatus tendinosis or partial thickness tears less than 1 cm in size, either dry needling or an injection of 3 ml of platelet-rich plasma have clinical benefits lasting up to 6 months, and that the benefits of PRP appear to be greater than those for dry needling (Rha, 2013). Dry needling has not been proven to be an efficacious therapy for supraspinatus tendinitis.

There is good evidence that in the setting of rotator cuff tendinopathy, a single dose of PRP provides no additional benefit over saline injection when the patients are enrolled in a program of active physical therapy (Kesikburun, 2013).

There is strong evidence that platelet rich therapy does not show a clinically important treatment effect for shoulder pain or function when given as an adjunct to arthroscopic rotator cuff repair. However, at present, there is also a lack of standardization of platelet preparation methods, which precludes clear conclusions about the effect of platelet-rich therapies for musculoskeletal soft tissue injuries ([Cochrane] Moraes, 2013; Gumina, 2012a; Lee, 2012b; Mall, 2014). The preponderance of the evidence suggests that PRP is not likely to have long term beneficial effects.

Therefore, PRP is *not generally recommended*. It may be considered in unusual circumstances for cases which meet the following three criteria:

• with tendon damage; *and*

- those who have not responded to appropriate conservative measures; ***and***

- those for whom the next level of guideline -consistent therapy would involve an invasive procedure with risk of significant complications.

If PRP is found to be indicated in these select patients, the first injection may be repeated once after 4 weeks when significant functional benefit is reported but the patient has not returned to full function or full duty at work*.*

c. **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.

d. **Shoulder Joint Steroid 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. There is some evidence that ultrasound-guided injection of corticosteroid into the shoulder provides a more anatomically accurate injection and is likely to have a small to moderate advantage over landmark-guided injection for pain relief at 6 weeks after the injection ([Cochrane] Bloom, 2012).

Complications: General complications of injections may include transient neurapraxia, nerve injury, infection, hematoma, glucose elevation, and endocrine changes.

The majority of diabetic patients will experience an increase in glucose following steroid injections. Average increases in one study were 125mg/dL and returned to normal in 48 hours, (Even, 2012) whereas in other studies, the increased glucose levels remained elevated up to 7 days, especially after multiple injections (Younes, 2007; Gonzalez, 2009; Habib, 2011). All diabetic patients should be told to follow their glucose levels carefully over the 7 days after a steroid injection. For patients who have not been diagnosed with diabetes, one can expect some increase in glucose due to insulin depression for a few days after a steroid injection. Clinicians may consider diabetic screening tests for those who appear to be at risk for type 2 diabetes (Ward, 2002; Moon, 2014; Younes, 2007;

Habib, 2011).

Intra-articular or epidural injections cause rapid drops in plasma cortisol levels which usually resolve in one to 4 weeks (Younes, 2007; Moon, 2014). There is some evidence that an intra-articular injection of 80 mg of methylprednisolone acetate into the knee has about a 25% probability of suppressing the adrenal gland response to exogenous adrenocortocotrophic hormone ACTH for four or more weeks after injection, but complete recovery of the adrenal response is seen by week 8 after injection (Habib, 2014). This adrenal suppression could require treatment if surgery or other physiologically stressful events occur.

Case reports of Cushing's syndrome, hypopituitarism and growth hormone deficiency have been reported uncommonly and have been tied to systemic absorption of intra-articular and epidural steroid injections (Lansang, 2009). Cushing's syndrome has also been reported from serial occipital nerve injections and paraspinal injections (Edmonds, 1991; Lavin, 2001).

Morning cortisol measurements may be ordered prior to repeating steroid injections or prior to the initial steroid injection when the patient has received multiple previous steroid injections.

The effect of steroid injections on bone mineral density (BMD) and any contribution to osteoporotic fractures is less clear. Patients on long term steroids are clearly more likely to suffer from fractures than those who do not take steroids. However, the contribution from steroid injections to this phenomena does not appear to be large. A well-controlled, large retrospective cohort study found that individuals with the same risk factors for osteoporotic fractures were 20% more likely to suffer a lumbar fracture if they had an epidural steroid injection. The risk increased with multiple injections (Mandel, 2013). Other studies have shown inconsistent findings regarding BMD changes (Kim, 2014; Kang 2012; Angeli, 2006).

Given this information regarding increase in blood glucose levels, effects on the endocrine system, and possible osteoporotic influence, it is suggested that intra-articular and epidural injections be limited to a total of 3 to 4 per year [**all joints combined**] (Khan, 2013; Ostergaard, 1998; Caldwell, 1996).

❖ Time to Produce Effect: Immediate with local anesthesia, or within 5 days if no anesthesia

❖ Optimum Duration: Usually 1 or 2 injections are adequate.

❖ Maximum Duration: 3 or 4 injections in one year at least 4 to 8 weeks apart, when functional benefits are demonstrated with each injection.

e. **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.

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. Subacromial Injections:

There is some evidence that in patients with chronic shoulder pain with or without accompanying stiffness, individually-tailored exercise therapy aimed at restoring dynamic joint stabilizing mechanisms and muscle coordination, or a single unguided subacromial injection of corticosteroid, or a combination of various physical modalities and ROM exercises is equally effective in the short term (Ginn, 2005).

There is some evidence that a subacromial injection of 60 mg of ketorolac is at least as effective as injection of 40 mg of triamcinolone in the short-term treatment of subacromial impingement syndrome (Min, 2013).

There is some evidence that 6 sessions of manual physical over a three week period are as effective as an injection of 40 mg triamcinolone for relief of symptoms of shoulder impingement symptoms and impairment up to one year after initial treatment. The same study also showed reduced use of health care services one year in the manual therapy group (Rhon, 2014).

There is strong evidence that subacromial steroid injections for rotator cuff tendinopathy have a rapid benefit. However, there is no evidence that differ from alternative therapies for intermediate or long-term relief (Coombes, 2010).

There is some evidence that both subacromial corticosteroid injection and a series of 10 acupuncture treatments combined with home exercises significantly decreased pain and improved shoulder function in patients with subacromial impingement syndrome, but neither treatment was significantly superior to the other (Johansson, 2011).

A study of a small group of healthy volunteers showed that a non-radiographically guided injection did not affect shoulder strength in the normal shoulder and was accurately placed in the subacromial bursa 90% of the time (Farshad, 2012).

There is some evidence that ultrasound-guided injections of corticosteroid into the shoulder provides a more anatomically accurate injection and is likely to have

a small to moderate advantage over landmark-guided injection for pain relief at 6 weeks after the injection ([Cochrane] Bloom, 2012).

There is some evidence that when subacromial injections are done without imaging guidance, there are no differences between anteromedial versus posteromedial approaches to subacromial injection with respect to accuracy or effectiveness, however the rotator cuff is frequently inadvertently injected with either approach (Henkus, 2006).

If there is a concern regarding needle placement, sonography or fluoroscopy may be used. The subacromial injection may also be repeated by a specialist skilled in this procedure to confirm the diagnosis.

Please refer to Section F.4.d. Shoulder Joint Steroid Injections, for steroid complications and number of treatments.

g. **Suprascapular Nerve Block**: There is no clear long-term functional benefit for suprascapular nerve blocks, however, blocks may be appropriate for patients when pain is not well-controlled and injections improve function ([BMJ Clinical Evidence] Murphy, 2010). These blocks may delay onset of significant pain post-surgery. There is no clear evidence of long-term functional gains in nonspecific shoulder pain, acromioclavicular joint disease, or rotator cuff disease ([BMJ Clinical Evidence] Murphy, 2010).

❖ Time to Produce Effect: One block should demonstrate increased ability to perform exercises and/or range-of-motion.

❖ Maximum Duration: 3 per year ([BMJ Clinical Evidence] Murphy, 2010).

h. **Trigger Point Injections and Dry Needling Treatment**:

i. Description — Trigger point injections are a generally accepted treatment. 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 ([Cochrane] Staal, 2008). 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 ([Cochrane] Staal, 2008). Needling alone may account for some of the therapeutic response. Needling must be performed by practitioners with the appropriate credentials in accordance with state and other applicable regulations.

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.

ii. <u>Indications</u> — 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 active therapy programs. Trigger point injections should be utilized primarily for the purpose of facilitating functional progress. Patients should continue in an aggressive aerobic and stretching 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. However, trigger point injections may be occasionally effective when utilized in the patient with immediate, acute onset of pain.

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

❖ Time to produce effect: Local anesthetic 30 minutes; 24 to 48 hours for no anesthesia.

❖ Frequency: Weekly. Suggest no more than 4 injection sites per session per week to avoid significant post-injection soreness.

❖ Optimum duration: 4 Weeks total for all injection sites.

❖ Maximum duration: 8 weeks total for all injection sites. Occasional patients may require 2 to 4 repetitions of trigger point injection series over a 1 to 2 year period.

i. **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. As of the time of this guidelines writing, viscosupplementation has been FDA approved for the treatment of knee

osteoarthritis when conservative non-pharmacologic treatment and simple analgesics (e.g. acetaminophen) have failed. Specific indications may vary according to the brand-name product. The FDA has not approved this for use in the shoulder.

There is insufficient evidence of the effectiveness of hyaluronate in rotator cuff tendonopathy, therefore it is *not recommended* for this condition (Chou, 2010).

There is some evidence that hyaluronic acid (HA) added to physical therapy (PT) does not improve symptomatic and functional outcomes of adhesive capsulitis over the improvements seen with PT alone (Hsieh, 2012). Therefore, it is *not recommended*.

There is good evidence that subacromial injection of hyaluronic acid is not more effective than steroid or placebo for pain relief and functional improvement of subacromial impingement syndrome (Penning, 2012). Therefore, it is *not recommended*.

There is good evidence that three weekly injections of HA alleviate the symptoms of glenohumeral osteoarthritis for up to 26 weeks in the absence of other shoulder pathology (Blaine, 2008, Kwon, 2013).

- ❖ Indications – glenohumeral osteoarthritis in the absence of other symptomatic shoulder pathology.

- ❖ Optimum Duration– 1 series of injections or a single injection, depending on the product used. Time parameters will vary according to the treatment regime as directed on the package insert. The regimes vary, from a single injection to a series of weekly injections over a period of several weeks. Providers must review brand name package insert prior to prescribing this treatment.

- ❖ Maximum Duration –sessions can be repeated only after a period of 6 months to encourage active therapy or delay joint replacement.

5. **INTERDISCIPLINARY REHABILITATION PROGRAMS:** This is the gold standard of treatment for individuals who have not responded to less intensive modes of treatment. There is good evidence that interdisciplinary programs which include screening for psychological issues, identification of fear-avoidance beliefs and treatment barriers, and establishment of individual functional and work goals will improve function and decrease disability (Dobscha, 2009; Lambeek, 2010). These programs should assess the impact of pain and suffering on the patient's medical, physical, psychological, social, and/or vocational functioning. In general, interdisciplinary programs evaluate and treat multiple and sometimes irreversible conditions, including, but not limited to: painful musculoskeletal, neurological, and other chronic pain conditions and psychological issues; drug dependence, abuse, or addiction; high levels of stress and anxiety; failed surgery; and pre-existing or latent psychopathology. The number of professions involved on the team in a chronic pain program may vary due to the complexity of the needs of the person served. The Division recommends consideration of referral to an interdisciplinary program within six months post-injury in patients with delayed recovery, unless

successful surgical interventions or other medical and/or psychological treatment complications intervene.

Chronic pain patients need to be treated as outpatients within a continuum of treatment intensity. Outpatient chronic pain programs are available with services provided by a coordinated interdisciplinary team within the same facility (formal) or as coordinated among practices by the authorized treating physician (informal). Formal programs are able to provide a coordinated, high-intensity level of services and are recommended for most chronic pain patients who have received multiple therapies during acute management.

Patients with addiction problems, high-dose opioid use, or use of other drugs of abuse may require inpatient and/or outpatient chemical dependency treatment programs before or in conjunction with other interdisciplinary rehabilitation. Guidelines from the American Society of Addiction Medicine are available and may be consulted relating to the intensity of services required for different classes of patients in order to achieve successful treatment.

Informal interdisciplinary pain programs may be considered for patients who are currently employed, those who cannot attend all-day programs, those with language barriers, or those living in areas not offering formal programs. Before treatment has been initiated, the patient, physician, and insurer should agree on treatment approach, methods, and goals. Generally, the type of outpatient program needed will depend on the degree of impact the pain has had on the patient's medical, physical, psychological, social, and/or vocational functioning.

When referring a patient for formal outpatient interdisciplinary pain rehabilitation, an occupational rehabilitation program, or an opioid treatment program, the Division recommends the program meets the criteria of the Commission on Accreditation of Rehabilitation Facilities (CARF).

Inpatient pain rehabilitation programs are rarely needed but may be necessary for patients with any of the following conditions: (a) high risk for medical instability; (b) moderate-to-severe impairment of physical/functional status; (c) moderate-to-severe pain behaviors; (d) moderate impairment of cognitive and/or emotional status; (e) dependence on medications from which he/she needs to be withdrawn; and (f) the need for 24-hour supervised nursing.

Whether formal or informal programs, they should be comprised of the following dimensions (CARF 2010-11):

- Communication: To ensure positive functional outcomes, communication between the patient, insurer, and all professionals involved must be coordinated and consistent. Any exchange of information must be provided to all professionals, including the patient. Care decisions should be communicated to all and should include the family and/or support system.

- Documentation: Through documentation by all professionals involved and/or discussions with the patient, it should be clear that functional goals are being actively pursued and measured on a regular basis to determine their

achievement or need for modification. It is advisable to have the patient undergo objective functional measures.

- Treatment Modalities: Use of modalities may be necessary early in the process to facilitate compliance with and tolerance to therapeutic exercise, physical conditioning, and increasing functional activities. Active treatments should be emphasized over passive treatments. Active and self-monitored passive treatments should encourage self-coping skills and management of pain, which can be continued independently at home or at work. Treatments that can foster a sense of dependency by the patient on the caregiver should be avoided. Treatment length should be decided based upon observed functional improvement. For a complete list of active and passive therapies, refer to F.12. Therapy – Active and F.13. Therapy – Passive. All treatment timeframes may be extended based on the patient's positive functional improvement.

- Therapeutic Exercise Programs: A therapeutic exercise program should be initiated at the start of any treatment rehabilitation. Such programs should emphasize education, independence, and the importance of an on-going exercise regimen. There is good evidence that exercise alone or part of a multi-disciplinary program results in decreased disability for workers with non-acute low back pain (Oesch, 2010). There is not sufficient evidence to support the recommendation of any particular exercise regimen over any other exercise regimen.

- Return to Work: The authorized treating physician should continually evaluate the patient for their potential to return to work. For patients currently employed, efforts should be aimed at keeping them employed. Formal rehabilitation programs should provide assistance in creating work profiles. For more specific information regarding return to work, refer to F.11. Return to Work.

- Patient Education: Patients with pain need to re-establish a healthy balance in lifestyle. All providers should educate patients on how to overcome barriers to resuming daily activity, including pain management, decreased energy levels, financial constraints, decreased physical ability, and change in family dynamics.

- Psychosocial Evaluation and Treatment: Psychosocial evaluation should be initiated, if not previously done. Providers of care should have a thorough understanding of the patient's personality profile, especially if dependency issues are involved. Psychosocial treatment may enhance the patient's ability to participate in pain treatment rehabilitation, manage stress, and increase their problem-solving and self-management skills.

- Vocational Assistance: Vocational assistance can define future employment opportunities or assist patients in obtaining future employment. Refer to F.13. Return to Work for detailed information.

Interdisciplinary programs are characterized by a variety of disciplines that participate in the assessment, planning, and/or implementation of the treatment program. These programs are for patients with greater levels of perceived disability, dysfunction, de-

conditioning, and psychological involvement. Programs should have sufficient personnel to work with the individual in the following areas: behavioral, functional, medical, cognitive, pain management, psychological, social, and vocational.

a. **Formal Interdisciplinary Rehabilitation Programs**:

i. Interdisciplinary Pain Rehabilitation: An Interdisciplinary Pain Rehabilitation Program provides outcome-focused, coordinated, goal-oriented interdisciplinary team services to measure and improve the functioning of persons with pain and encourage their appropriate use of health care system and services. The program can benefit persons who have limitations that interfere with their physical, psychological, social, and/or vocational functioning. The program shares information about the scope of the services and the outcomes achieved with patients, authorized providers, and insurers.

The interdisciplinary team maintains consistent integration and communication to ensure that all interdisciplinary team members are aware of the plan of care for the patient, are exchanging information, and implement the plan of care. The team members make interdisciplinary team decisions with the patient and then ensure that decisions are communicated to the entire care team.

The Medical Director of the pain program should ideally be board certified in pain management; or he/she should be board certified in his/her specialty area and have completed a one-year fellowship in interdisciplinary pain medicine or palliative care recognized by a national board or have two years of experience in an interdisciplinary pain rehabilitation program. Teams that assist in the accomplishment of functional, physical, psychological, social, and vocational goals must include: a medical director, pain team physician(s), who should preferably be board certified in an appropriate specialty, and a pain team psychologist. Professionals from other disciplines on the team may include, but are not limited to: a biofeedback therapist, an occupational therapist, a physical therapist, a registered nurse (RN), a case manager, an exercise physiologist, a psychologist, a psychiatrist, and/or a nutritionist.

❖ Time to Produce Effect: 3 to 4 weeks.

❖ Frequency: Full time programs – No less than 5 hours per day, 5 days per week; part-time programs – 4 hours per day, 2–3 days per week.

❖ Optimum Duration: 3 to 12 weeks at least 2–3 times a week. Follow-up visits weekly or every other week during the first 1 to 2 months after the initial program is completed.

❖ Maximum Duration: 4 months for full-time programs and up to 6

months for part-time programs. Periodic review and monitoring thereafter for 1 year, AND additional follow-up based on the documented maintenance of functional gains.

ii. <u>Occupational Rehabilitation</u>: This is a formal 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 work day. A full work day is case specific and is defined by the previous employment of the patient. Safe workplace practices and education of the employer and family and/or social support system regarding the person's status should be included. This is accomplished by addressing the medical, psychological, behavioral, physical, functional, and vocational components of employability and return to work.

There is some evidence that an integrated care program, consisting of workplace interventions and graded activity teaching that pain need not limit activity, is effective in returning patients with chronic low back pain to work, even with minimal reported reduction of pain (Lambeek, 2010).

The occupational medicine rehabilitation 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; an occupational therapist; and a physical therapist.

As appropriate, the team may also include any of the following: chiropractor, an RN, a case manager, a psychologist, a vocational specialist, or a certified biofeedback therapist.

❖ Time to Produce Effect: 2 weeks.

❖ Frequency: 2 to 5 visits per week, up to 8 hours per day.

❖ Optimum Duration: 2 to 4 weeks.

❖ Maximum Duration: 6 weeks. Participation in a program beyond 6 weeks must be documented with respect to need and the ability to facilitate positive symptomatic and functional gains.

iii. <u>Opioid/Chemical Treatment Programs</u>: Refer to the Division's Chronic Pain Disorder Medical Treatment Guidelines.

b. **Informal Interdisciplinary Rehabilitation Program:** A coordinated interdisciplinary pain rehabilitation program is one in which the authorized treating physician coordinates all aspects of care. This type of program is similar to the formal programs in that it is goal-oriented and provides interdisciplinary rehabilitation services to manage the needs of the patient in the following areas: (a) functional, (b) medical, (c) physical, (d) psychological, (e) social, and (f)

vocational.

This program is different from a formal program in that it involves lower frequency and intensity of services/treatment. Informal rehabilitation is geared toward those patients who do not need the intensity of service offered in a formal program or who cannot attend an all-day program due to employment, daycare, language, or other barriers.

Patients should be referred to professionals experienced in outpatient treatment of chronic pain. The Division recommends the authorized treating physician consult with physicians experienced in the treatment of chronic pain to develop the plan of care. Communication among care providers regarding clear objective goals and progress toward the goals is essential. Employers should be involved in return to work and work restrictions, and the family and/or social support system should be included in the treatment plan. Professionals from other disciplines likely to be involved include: a biofeedback therapist, an occupational therapist, a physical therapist, an RN, a psychologist, a case manager, an exercise physiologist, a psychiatrist, and/or a nutritionist.

- ❖ Time to Produce Effect: 3 to 4 weeks.

- ❖ Frequency: Full-time programs – No less than 5 hours per day, 5 days per week; Part-time programs – 4 hours per day for 2–3 days per week.

- ❖ Optimum Duration: 3 to 12 weeks at least 2–3 times a week. Follow-up visits weekly or every other week during the first 1 to 2 months after the initial program is completed.

- ❖ Maximum Duration: 4 months for full-time programs and up to 6 months for part-time programs. Periodic review and monitoring thereafter for 1 year, and additional follow-up based upon the documented maintenance of functional gains.

6. **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. 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.

a. **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.

b. **Interventions**: should consider engineering controls (e.g. mechanizing the task, changing the tool used, or adjusting the jobsite), or administrative controls (e.g. adjusting the time an individual performs the task).

Temporary restrictions may be needed while recommended ergonomic or adaptive equipment is obtained; employers should obtain recommended equipment in a timely manner.

7. **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 iontphoretics/phonophoretics, such as steroid creams and lidocaine.

The following are listed in alphabetical order.

a. **Acetaminophen**: An effective analgesic with anti-pyretic but not anti-inflammatory activity. Acetaminophen is generally well-tolerated, causes little or no gastrointestinal (GI) 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 contain acetaminophen. The total daily dose of acetaminophen is recommended not to exceed three grams per 24-hour period, from all sources, including narcotic-acetaminophen combination preparations.

❖ Optimum Duration: 7 to 10 days.

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

b. **Minor Tranquilizer/Muscle Relaxants**: Appropriate for objective findings of muscle spasm with pain. When prescribing these agents, physicians must seriously consider all central nervous system (CNS) side effects including drowsiness or dizziness and the fact that benzodiazepines may be habit-forming**.** Carisoprodol should not be used as its active metabolite, meprobamate, is commonly abused. Chronic use of benzodiazepines or any muscle relaxant is *not recommended* due to their habit-forming potential, seizure risk following abrupt withdrawal, and documented contribution to deaths of patients on opioids due to respiratory depression. A number of muscle relaxants interact with other medications.

❖ Optimum Duration: 1 week.

❖ Maximum Duration: 2 weeks (or longer if used only at night).

c. **Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)**: 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 FDA advises that many NSAIDs may cause an increased risk of serious cardiovascular thrombotic events, myocardial infarction, and stroke, which can be fatal. There is good evidence that naproxen has the least risk for cardiovascular events when compared to other NSAIDs (Trelle, 2011). Administration of proton pump inhibitors, Histamine 2 Blockers or prostaglandin analog misoprostol along with these NSAIDs may reduce the risk of duodenal and gastric ulceration, in those at higher risk for this adverse event (e.g. age > 60, concurrent antiplatelet or corticosteroid therapy). They do not impact possible cardiovascular complications (Hooper, 2004). Due to the cross-reactivity between aspirin and NSAIDs, NSAIDs should not be used in aspirin-sensitive patients, and it 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. Patients with renal or hepatic disease may need increased dosing intervals with chronic use. Chronic use of NSAIDs is *generally not recommended* due to increased risk of cardiovascular events and GI bleeding.

There is some evidence that in the setting of long bone fractures of the femur, tibia, and humerus, NSAID administration in the first 48 hours after injury is associated with poor healing of the fracture (Jeffcoach, 2014).

Certain NSAIDs may have interactions with various other medications. Individuals may have adverse events not listed above. Intervals for metabolic screening are dependent on the patient's age and 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.

i. Non-Selective Non-Steroidal Anti-Inflammatory Drugs:

Includes NSAIDs and acetylsalicylic acid. 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 GI toxicity and what steps to take if they occur. Anaphylactoid reactions may occur in patients taking NSAIDs. NSAIDs may interfere with platelet function. Fluid retention and edema have been observed in some patients taking NSAIDs.

❖ Optimal Duration: 1 week.

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

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

COX-2 inhibitors differ from the traditional NSAIDs in adverse side effect profiles. The major advantages of selective COX-2 inhibitors over traditional NSAIDs are that they have less GI 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.

d. **Opioids**: should be primarily reserved for the treatment of severe upper extremity pain. There are circumstances where prolonged use of opioids 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, opioid 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.

Opioids 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 opioid 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. Use beyond 2 weeks is acceptable in appropriate cases when functional improvement is documented. Refer to the Division's Chronic Pain Disorder Medical Treatment Guidelines, which give a detailed discussion regarding medication use in chronic pain management. Use beyond 30 days after non-traumatic injuries, or 6 weeks post-surgery after the original injury or post-operatively is *not recommended*. If necessary the physician should access the Colorado Prescription Drug Monitoring Program (PDMP) and follow recommendations in Chronic Pain Guideline. This system allows the prescribing physician to see most of the controlled substances prescribed by other physicians for an individual patient.

e. **Platelet Rich Therapy**: Refer to Section F.4.b. Platelet Rich Plasma (PRP).

f. **Psychotropic/Anti-anxiety/Hypnotic Agents**: May be useful for treatment of mild and chronic pain, dysesthesias, 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 doses, are useful for chronic neurogenic pain with difficulty sleeping 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 anti-depressants prior to bedtime. Frequently, combinations of the above agents are useful. As a general rule, physicians should assess 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 generally recommended*. Refer to the Division's Chronic Pain Disorder Medical Treatment 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.

g. **Tramadol**: Useful in the relief of 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 GI ulceration, and does not 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 monoamine oxidase

(MAO) inhibitors, SSRIs, some muscle relaxants, and tricyclic antidepressants. Because it inhibits the reuptake of norepinephrine and serotonin, use with other agents that increase norepinephrine and/or serotonin (e.g. SNRIs, mirtazapine, TCAs, SSRIs) can result in serotonin syndrome. This medication has physically addictive properties, and withdrawal may follow abrupt discontinuation; thus, it is *not recommended* for those with prior opioid addiction.

❖ Optimum Duration: 3 to 7 days.

❖ Maximum Duration: 2 weeks. Use beyond 2 weeks is acceptable in appropriate cases.

h. **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 oral 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 Section F.15.e. Iontophoresis.

8. **ORTHOTICS AND PROSTHETICS**:

a. **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.

b. **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.

c. **Splints or Adaptive Equipment**: design, fabrication and/or modification indications include the need to control neurological and orthopedic injuries for reduced stress during functional activities and modify tasks through instruction in the use of a device or physical modification of a device, which reduces stress on the injury. Equipment should improve safety and reduce risk of re-injury. This

includes high and low technology assistive options such as workplace modifications, 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.

9. **EDUCATION/INFORMED DECISION MAKING** 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. Unfortunately, practitioners often think of education and informed decision making last, after medications, manual therapy, and surgery.

Informed decision making is the hallmark of a successful treatment plan. In most cases the continuum of treatment from the least invasive to the most invasive (e.g. surgery) should be discussed. The intention is to find the treatment along this continuum which most completely addresses the condition. Patients should identify their personal functional goals of treatment at the first visit. It is recommended that specific individual goals are articulated at the beginning of treatment as this is likely to lead to increased patient satisfaction above that achieved from improvement in pain or other physical function (Hazard, 2009). Progress toward the individual functional goals identified should be addressed at follow up visits and throughout treatment by other members of the health care team as well as the authorized physicians.

Documentation of this process should occur whenever diagnostic tests or referrals from the authorized treating physician are contemplated. The informed decision making process asks the patient to set their personal functional goals of treatment, describe their current health status and any concerns they have regarding adhering to the diagnostic or treatment plan proposed. The provider should clearly describe the following:

- The expected functional outcomes from the proposed treatment, or expected results and plan of action if diagnostic tests are involved.

- Any side effects and risks to the patient.

- Required post treatment rehabilitation time and impact on work, if any.

- Alternative therapies or diagnostic testing.

Before diagnostic tests or referrals for invasive treatment take place the patient should be able to clearly articulate the goals of the intervention, the general side effects and risks associated with it and their decision regarding compliance with the suggested plan. There is some evidence that information provided only by video is not sufficient education (Newcomer, 2008).

Practitioners must develop and implement an effective strategy and skills to educate patients, employers, insurance systems, policy makers, and the community as a whole.

An education-based paradigm should always start with providing reassuring information to the patient and informed decision making. More in-depth education currently exists within a treatment regimen employing functional restoration, prevention, and cognitive behavioral techniques. Patient education and informed decision making should facilitate self-management of symptoms and prevention.

❖ Time to produce effect: Varies with individual patient

❖ Frequency: Should occur at every visit.

10. **PERSONALITY/PSYCHOSOCIAL/PSYCHOLOGICAL INTERVENTION**: Psychosocial treatment is a well-established therapeutic and diagnostic intervention with selected use in acute pain problems and more widespread use in sub-acute and chronic pain populations. Psychosocial treatment is recommended as an important component in the total management of a patient with chronic pain and should be implemented as soon as the problem is identified.

If a diagnosis consistent with the standards of the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM) has been determined, the patient should be evaluated for the potential need for psychiatric medications. Use of any medication to treat a diagnosed condition may be ordered by the authorized treating physician or by the consulting psychiatrist. Visits for management of psychiatric medications are medical in nature and are not a component of psychosocial treatment. Therefore, separate visits for medication management may be necessary, depending on the patient and medications selected.

Psychosocial interventions include psychotherapeutic treatments for mental health conditions, as well as behavioral medicine treatments. These interventions may similarly be beneficial for patients without psychiatric conditions, but who may need to make major life changes in order to cope with pain or adjust to disability. Examples of these treatments include cognitive behavioral therapy (CBT), relaxation training, mindfulness training, and sleep hygiene training.

The screening or diagnostic workup should clarify and distinguish between pre-existing, aggravated, and/or purely causative psychological conditions. Therapeutic and diagnostic modalities include, but are not limited to, individual counseling and group therapy. Treatment can occur within an individualized model, a multi-disciplinary model, or a structured pain management program.

A psychologist with a PhD, PsyD, EdD credentials, or a psychiatric MD/DO may perform psychosocial treatments. Other licensed mental health providers or licensed health care providers with training in CBT, or certified as CBT therapists who have experience in treating chronic pain disorders in injured workers, may also perform treatment in consultation with a PhD, PsyD, EdD, or psychiatric MD/DO.

CBT refers to a group of psychological therapies that are sometimes referred to by more specific names, such as Rational Emotive Behavior Therapy, Rational Behavior Therapy, Rational Living Therapy, Cognitive Therapy, and Dialectic Behavior Therapy. Variations of CBT methods can be used to treat a variety of conditions, including chronic pain, depression, anxiety, phobias, and post-traumatic stress disorder (PTSD). For patients

with multiple diagnoses, more than one type of CBT might be needed. The CBT used in research studies is often "manualized CBT," meaning that the treatment follows a specific protocol in a manual (Thorn, 2004). In clinical settings, CBT may involve the use of standardized materials, but it is also commonly adapted by a psychologist or psychiatrist to the patient's unique circumstances. If the CBT is being performed by a non-mental health professional, a manual approach would be strongly recommended. CBT must be distinguished from neuropsychological therapies used to teach compensatory strategies to brain injured patients, which are also called "cognitive therapy."

It should be noted that most clinical trials on CBT exclude subjects who have significant psychiatric diagnoses. Consequently, the selection of patients for CBT should include the following considerations. CBT is instructive and structured, using an educational model with homework to teach inductive rational thinking. Because of this educational model, a certain level of literacy is assumed for most CBT protocols. Patients who lack the cognitive and educational abilities required by a CBT protocol are unlikely to be successful. Further, given the highly structured nature of CBT, it is more effective when a patient's circumstances are relatively stable. For example, if a patient is about to be evicted, is actively suicidal, or is coming to sessions intoxicated, these matters will generally preempt CBT treatment for pain, and require other types of psychotherapeutic response. Conversely, literate patients whose circumstances are relatively stable, but who catastrophize or cope poorly with pain or disability are often good candidates for CBT for pain. Similarly, literate patients whose circumstances are relatively stable, but who exhibit unfounded medical phobias, are often good candidates for CBT for anxiety.

There is good evidence that cognitive intervention reduces low back disability in the short term and in the long term. In one of the studies the therapy consisted of 6, 2-hour sessions given weekly to workers who had been sick-listed for 8-12 weeks. Comparison groups included those who received routine care (Storheim, 2003; Linton, 2005). There is good evidence that psychological interventions, especially CBT, are superior to no psychological intervention for chronic low back pain, and that self-regulatory interventions, such as biofeedback and relaxation training, may be equally effective (Hoffman, 2007). There is good evidence that six group therapy sessions lasting one and a half hours each focused on CBT skills improved function and alleviated pain in uncomplicated sub-acute and chronic low back pain patients (Lamb, 2010). There is some evidence that CBT provided in seven two-hour small group sessions can reduce the severity of insomnia in chronic pain patients (Currie, 2000). A Cochrane meta-analysis grouped very heterogenous behavioral interventions and concluded that there was good evidence that CBT may reduce pain and disability but the effect size was uncertain ([Cochrane] Eccleston, 2009). In total, the evidence clearly supports CBT, and it should be offered to all chronic pain patents who do not have other serious issues, as discussed above.

CBT is often combined with active therapy in an interdisciplinary program, whether formal or informal. It must be coordinated with a psychologist or psychiatrist. CBT can be done in a small group or individually, and the usual number of treatments varies between 8 and16 sessions.

Before CBT is done, the patient must have a full psychological evaluation. The CBT program must be done under the supervision of a PhD, PsyD, EdD, or psychiatric MD/DO.

Psychological Diagnostic and Statistical Manual of Mental Disorders (DSM) Axis I disorders are common in chronic pain. One study demonstrated that the majority of patients who had failed other therapy and participated in an active therapy program also suffered from major depression. However, in a program that included CBT and other psychological counseling, the success rate for return to work was similar for those with and without a DSM IV diagnosis. This study further strengthens the argument for having some psychological intervention included in all chronic pain treatment plans (Gatchel, 1994).

For all psychological/psychiatric interventions, an assessment and treatment plan with measurable behavioral goals, time frames, and specific interventions planned, must be provided to the treating physician prior to initiating treatment. A status report must be provided to the authorized treating physician every two weeks during initial more frequent treatment and monthly thereafter. The report should provide documentation of progress toward functional recovery and a discussion of the psychosocial issues affecting the patient's ability to participate in treatment. The report should also address pertinent issues such as pre-existing, aggravated, and/or causative issues, as well as realistic functional prognosis.

a. Cognitive Behavioral Therapy (CBT) or Similar Treatment:

❖ Time to Produce Effect: 6 to 8 1–2 hour session, group or individual (1-hour individual or 2-hour group).

❖ Maximum Duration: 16 sessions.

NOTE: Before CBT is done, the patient must have a full psychological evaluation. The CBT program must be done under the supervision of a PhD, PsyD, EdD, or Psychiatric MD/DO.

b. Other Psychological/Psychiatric Interventions:

❖ Time to Produce Effect: 6 to 8 weeks.

❖ Frequency: 1 to 2 times weekly for the first 2 weeks (excluding hospitalization, if required), decreasing to 1 time per week for the second month. Thereafter, 2 to 4 times monthly with the exception of exacerbations, which may require increased frequency of visits. Not to include visits for medication management

❖ Optimum Duration: 2 to 6 months.

❖ Maximum Duration: 6 months. Not to include visits for medication management. For select patients, longer supervised psychological/psychiatric treatment may be required, especially if there are ongoing medical procedures or complications. If counseling beyond 6 months is indicated, the management of psychosocial risks or functional progress must be documented. Treatment plan/progress must show

severity.

11. **RESTRICTION OF ACTIVITIES**: Continuation of normal daily activities is the recommendation for most patients since immobility will negatively affect rehabilitation. Prolonged immobility results in a wide range of deleterious effects, such as a reduction in aerobic capacity and conditioning, loss of muscle strength and flexibility, increased segmental stiffness, promotion of bone demineralization, impaired disc nutrition, and the facilitation of the illness role.

Some level of immobility may occasionally be appropriate which could include bracing. While these interventions may occasionally have been ordered in the acute phase, the provider should be aware of their impact on the patient's ability to adequately comply with and successfully complete rehabilitation. Activity should be increased based on the improvement of core strengthening.

Patients should be educated regarding the detrimental effects of immobility versus the efficacious use of limited rest periods. Adequate rest allows the patient to comply with active treatment and benefit from the rehabilitation program. In addition, complete work cessation should be avoided, if possible, since it often further aggravates the pain presentation and promotes disability. Modified return to work is almost always more efficacious and rarely contraindicated in the vast majority of injured workers.

12. **RETURN-TO-WORK**: Return to work and/or work-related activities whenever possible is one of the major components in treatment and rehabilitation. Return to work is a subject that should be addressed by each workers' compensation provider at the first meeting with the injured employee and updated at each additional visit. A return-to-work format should be part of a company's health plan, knowing that return to work can decrease anxiety, reduce the possibility of depression, and reconnect the worker with society.

Because a prolonged period of time off work will decrease the likelihood of return to work, the first weeks of treatment are crucial in preventing and/or reversing chronicity and disability mindset. In complex cases, experienced nurse case managers may be required to assist in return to work. Other services, including psychological evaluation and/or treatment, jobsite analysis, and vocational assistance, may be employed.

Two counseling sessions with an occupational physician, and work site visit if necessary, may be helpful for workers who are concerned about returning to work (Jensen, 2012).

At least one study suggests that health status is worse for those who do not return to work than those who do. Self-employment and injury severity predict return to work. Difficulty with pain control, ADLs, and anxiety and depression were common (Kendrick, 2001).

The following should be considered when attempting to return an injured worker with chronic pain to work.

a. **Job History Interview:** The authorized treating physician should perform a job history interview at the time of the initial evaluation and before any plan of treatment is established. Documentation should include the workers' job

demands, stressors, duties of current job, and duties of job at the time of the initial injury. In addition, cognitive and social issues should be identified, and treatment of these issues should be incorporated into the plan of care.

b.   **Coordination of Care:** Management of the case is a significant part of return to work and may be the responsibility of the authorized treating physician, occupational health nurse, risk manager, or others. Case management is a method of communication between the primary provider, referral providers, insurer, employer, and employee. Because case management may be coordinated by a variety of professionals, the case manager should be identified in the medical record.

c.   **Communication:** This is essential between the patient, authorized treating physician, employer, and insurer. Employers should be contacted to verify employment status, job duties and demands, and policies regarding injured workers. In addition, the availability and duration of temporary and permanent restrictions, as well as other placement options, should be discussed and documented. All communications in the absence of the patient are required to be documented and made available to the patient.

d.   **Establishment of Return-to-Work Status:** Return to work for persons with chronic pain should be considered therapeutic, assuming that work is not likely to aggravate the basic problem or increase the discomfort. In most cases of chronic pain, the worker may not be currently working or even employed. The goal of return to work would be to implement a plan of care to return the worker to any level of employment with the current employer or to return him/her to any type of new employment. Temporary restrictions may be needed while recommended ergonomic or adaptive equipment is obtained; employers should obtain recommended equipment in a timely manner.

e.   **Establishment of Activity Level Restrictions:** A formal job description for the injured worker is necessary to identify physical demands at work and assist in the creation of modified duty. A jobsite evaluation may be utilized to identify applicable tasks such as pushing, pulling, lifting, reaching, grasping, pinching, sitting, standing, posture, ambulatory distance and terrain, and if applicable, environment for temperature, air flow, noise, and the number of hours that may be worked per day. Also refer to Section F.6. Jobsite Alterations. Due to the lack of predictability regarding exacerbation of symptoms affecting function, an extended, occupationally focused functional capacity evaluation may be necessary to determine the patient's tolerance for job type tasks over a continued period of time. Job requirements should be reviewed for the entire 8 hours or more of the working day. Between one and three days after the evaluation, there should be a follow-up evaluation by the treating therapist and/or the authorized treating physician to assess the patient's status. When prescribing the FCE, the physician must assess the probability of return to work against the potential for exacerbation of the work related condition. Work restrictions assigned by the authorized treating physician may be temporary or permanent. The case manager should continue to seek out modified work until restrictions become less cumbersome or as the worker's condition improves or deteriorates.

f. **Rehabilitation and Return to Work:** As part of rehabilitation, every attempt should be made to simulate work activities so that the authorized treating physician may promote adequate job performance. The use of ergonomic or adaptive equipment, therapeutic breaks, and interventional modalities at work may be necessary to maintain employment.

g. **Vocational Assistance:** Formal vocational rehabilitation is a generally accepted intervention and can assist disabled persons to return to viable employment. Assisting patients to identify vocational goals will facilitate medical recovery and aid in the achievement of MMI by (1) increasing motivation towards treatment and (2) alleviating the patient's emotional distress. Physically limited patients will benefit most if vocational assistance is provided during the interdisciplinary rehabilitation phase of treatment. To assess the patient's vocational capacity, a vocational assessment utilizing the information from occupational and physical therapy assessments may be utilized to identify rehabilitation program goals, as well as optimize both patient motivation and utilization of rehabilitation resources. This may be extremely helpful in decreasing the patient's fear regarding an inability to earn a living, which can add to his/her anxiety and depression.

Recommendations to Employers and Employees of Small Businesses: employees of small businesses who are diagnosed with chronic pain may not be able to perform any jobs for which openings exist. Temporary employees may fill those slots while the employee functionally improves. Some small businesses hire other workers, and if the injured employee returns to the job, the supervisor/owner may have an extra employee. To avoid this, it is suggested that case managers be accessed through their payer or third-party administrator. Case managers may assist with resolution of these problems, as well as assist in finding modified job tasks, or find jobs with reduced hours, etc. depending on company philosophy and employee needs.

Recommendations to Employers and Employees of Mid-sized and Large Businesses: Employers are encouraged by the Division to identify modified work within the company that may be available to injured workers with chronic pain who are returning to work with temporary or permanent restrictions. To assist with temporary or permanent placement of the injured worker, it is suggested that a program be implemented that allows the case manager to access descriptions of all jobs within the organization.

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.

The use and integration of active and passive therapies should be directed at addressing impairments found in the clinical examination which may include abnormal posture, head tilting forward, scapula dyskinesia and joint/tissue hypomobility/hypermobility. These clinical findings are frequently contributors to shoulder and thoracic outlet symptoms and many times result in scapula anterior tipping and altered motor control of the scapula/thoracic and glenohumeral joints. In this classification of scapula dysfunction, the primary external visual feature is the anterior tilting of the scapula in the sagittal plane which produces the prominent inferior angle of the scapula. Many times the anterior tilting is associated with shortening of the pectoralis minor and poor function of the scapula muscles controlling the inferior angle. This myofascial and scapula dysfunction places the acromion in a position closer to the rotator cuff and humeral head and can thereby compromise the subacromial space. Additionally, this resultant scapula dyskinesia disrupts the length tension relationships of the shoulder complex's static and dynamic constraints and subsequently facilitates poor humeral head positioning on the glenoid. (The static constraints are the glenohumeral ligaments and the dynamic constraints are the deltoid and cuff musculature.) Therefore the treatment of this scapula dyskinesia and myofascial dysfunction is important for restoration of the normal upper quarter function.

The healthy function of the shoulder is inextricably dependent on the proper function and balanced relationships with its neighboring structures: cervical, thoracic, costal, and when one acknowledges the role of fascia, particularly the thoracodorsal fascia. Therefore, effective and expedient rehabilitation requires providers to have an excellent understanding of the functional anatomy of these structures and their dynamic inter-relatedness. Shoulder injuries are complex. Successful treatment of these injuries requires the providers have expert skills. Collaboration is essential in achieving optimal outcomes.

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 use of a patient completed pain drawing, visual analog scale (VAS), and functional outcome tools is highly recommended to help providers track progress. Functional objective goals including minimum clinically important difference (MCID) of the functional tools should be monitored and documented regularly to determine the effectiveness of 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 co-morbidities 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, then alternative treatment interventions, further diagnostic studies, or further consultations should be pursued.

The following active therapies are listed in alphabetical order:

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

❖ Time to Produce Effect: 4 to 5 treatments.

❖ Frequency: 3 to 5 times per week.

❖ Optimum Duration: 4 to 6 weeks.

❖ Maximum Duration: 6 weeks.

b. **Aquatic Therapy**: is a well-accepted treatment which consists of the therapeutic use of aquatic immersion for therapeutic exercise to promote ROM, flexibility, 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 (Castillo-Lozano, 2014). 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 range of motion. 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 (Thein, 2000; Speer, 1993).

c. **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.

d. **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.

e. **Neuromuscular Re-education**: is a generally accepted treatment. Neuromuscular re-education is the skilled application of exercise with manual, mechanical, or electrical facilitation to enhance strength; movement patterns; neuromuscular response; proprioception, kinesthetic sense, coordination; education of movement, balance and posture. Changes in posture and scapula movements are important to restore normal upper quarter movements and minimize shoulder and thoracic outlet symptoms. Indications include the need to promote neuromuscular responses through carefully timed proprioceptive stimuli to elicit and improve motor activity in patterns similar to normal neurologically developed sequences, and improve neuromotor response with independent control. Muscles that should be targeted for correct timing and recruitment include the serratus anterior, upper trapezius, lower trapezius and middle trapezius. Accessory stabilizers including the rhomboids, latissimus dorsi and levator

scapula should also be addressed to assist with scapula setting. Normal scapula positioning and movements should be the goal of the neuromuscular re-education. Furthermore, the limitations in flexibility and motor control of the pectoralis minor are a common incriminator with this type of dysfunction.

❖ Time to Produce Effect: 2 to 6 treatments.

❖ Frequency: 3 times per week.

❖ Optimum Duration: 4 to 8 weeks.

❖ Maximum Duration: 8 weeks.

f. **Therapeutic Exercise**: is a generally well-accepted treatment. Therapeutic exercise with or without mechanical assistance or resistance, may include manual facilitation, 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. In most cases the therapist instructs the patient in a supervised clinic and home program to increase motion with tissue elasticity and subsequently increase strength and endurance. Usually, manual therapy is performed initially to assure correct muscle activation followed by isometrics and progressing to isotonic exercises as tolerated.

There is strong evidence for those with subacromial impingement syndrome that; 1) exercise has a small to moderate effect in reducing pain and improving function in the short term; 2) exercise has a small to moderate effect in improving function in the long-term. There is good evidence that exercise provides moderate improvement in strength in the short-term. There is inadequate evidence to determine a specific evidence-based exercise protocol or frequency. Common exercises used in the studies are scapular stability training and progressive rotator cuff strengthening exercises using pulley equipment or elastic resistance bands under supervision 1 to 2 times per week along with daily home exercises. Exercises are conducted through range to 90° abduction (Hanratty, 2012).

There is some evidence that a scapular focused exercise treatment protocol that includes scapular motor control exercises, scapular mobilizations, and stretching is effective for reducing pain and improving shoulder function in patients with subacromial impingement syndrome (Struyf, 2013).

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.

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.

a. **Continuous Passive Motion (CPM)**:

This is **not generally recommended**, please refer to Rotator Cuff Tear, Section E.10.

b. **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 month.

❖ Maximum Duration: Use beyond 6 weeks requires a home unit.

c. **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*** ([Cochrane] Bennett, 2012).

d. **Immobilization**: Time and duration are 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. Refer to specific diagnosis for details.

e. **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, dexamethasone), edema (mecholyl, hyaluronidase, salicylate), ischemia (magnesium, mecholyl, iodine), muscle spasm (magnesium, calcium), calcific deposits (acetate), scars, and keloids (chlorine, iodine, acetate). An experimental study with healthy human volunteers that an iontophoretic preparation of dexamethasone phosphate penetrated up to a depth of 12 mm, but even after 400 minutes following iontophoresis, half of the dexamathasone had penetrated no deeper than 2 mm. Iontophoresis appears to be effective only in superficial tissues. (Anderson 2003). Per the Colorado Physical Therapy Practice Act, referring physician must write a prescription for medication, and the individual must bring the medication (not the prescription for medication) to the treating therapist for use in iontophoresis.

❖ 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. **Low Level Laser Therapy**: There is good evidence that a clinically important effect of laser on pain and range of motion is unlikely (Abrisham, 2011; Bingol, 2005; Calis, 2011; Dogan, 2010; Yeldan, 2009; Bal, 2009). Therefore, it is *not recommended*.

g. **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 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) 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.

h. **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, atrophy, decreased circulation, osteogenic stimulation, inflammation, peripheral neuropathies and the need to facilitate muscle hypertrophy, muscle strengthening, and muscle responsiveness.

❖ Time to Produce Effect: Variable, depending upon use.

❖ Frequency: 3 to 7 times per week.

❖ Optimum Duration: 8 weeks.

❖ Maximum Duration: 2 months.

i. **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.

j. **Microwave Diathermy**: There is some evidence that microwave diathermy plus superficial heat and exercise is not more clinically effective than placebo microwave diathermy plus superficial heat and exercise in the reduction of pain and disability, and the improvement of ROM, muscle strength, functional status, quality of life, and depression after 3 weeks of treatment in patients with subacromial impingement syndrome (Akyol, 2012). Therefore, it is *not recommended*.

k. **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.

There is some evidence that 6 sessions of manual physical therapy over a three week period are as effective as an injection of 40 mg triamcinolone for relief of symptoms of shoulder impingement symptoms and impairment up to one year after initial treatment. The same study also showed reduced use of health care services one year in the manual therapy group (Rhon, 2014).

❖ Time to Produce Effect: 6 to 9 treatments.

❖ Frequency: 3 times per week.

❧   Optimum Duration: 6 weeks.

❧   Maximum Duration: 2 months.

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

❧   Time to Produce Effect: 2 to 3 weeks.

❧   Frequency: 2 to 3 times per week.

❧   Optimum Duration: 4 to 6 weeks.

❧   Maximum Duration: 6 weeks.

m.   **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.

n.   **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.

o. **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, 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. There is some evidence that ultrasound compared with sham ultrasound as part of an overall rehabilitation protocol including exercise, stretching, and heat treatments have approximately equal effects in the treatment of patients with adhesive capsulitis (Dogru, 2008). There is no evidence that phonophoresis should be used as an isolated treatment. All phonophoresis should be used in conjunction with manipulative and physical therapy/rehabilitation.

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-inflammatories 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.

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 strongly be considered post-operatively in any patient not making expected functional progress within three weeks after surgery.

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.13. Return-To-Work.

The patient and treating physician have identified 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 including home exercise. The provider should be especially careful to make sure the patient understands the amount of post-operative treatment required and the length of partial- and full-disability expected post-operatively. The patient should have committed to the recommended post-operative treatment plan and fully completed the recommended active, manual and pre-operative treatment plans.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

1. ARTHRODESIS:

a. Description/Definition:

Fusion of the shoulder. Used as a salvage procedure.

b. Occupational Relationship:

Secondary to severe trauma and failure of other procedures.

c.   **Specific Physical Exam Findings**:

Shoulder function is minimal and is usually associated with severe rotator cuff pathology.

d.   **Diagnostic Testing Procedures**:

See Specific Diagnostic sections.

e.   **Surgical Indications**:

Inability to perform activities of daily living due to failed previous procedures and severe chronic pain unresponsive to non-addicting medication.

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

Smoking may affect soft tissue healing through tissue hypoxia. Patients should be strongly encouraged to stop smoking and be provided with appropriate counseling by the physician. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

f.   **Operative Treatment**:

Fusion.

g.   **Post-operative Treatment**:

An individualized rehabilitation program will be based upon communication between the surgeon and the therapist. Therapy may begin 6 weeks to 3 months after surgery, 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 aquatic 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.

2. HARDWARE REMOVAL:

a. Description/Definition:

Surgical removal of internal or external fixation device, commonly related to fracture repairs.

b. Occupational Relationship:

Following healing of a post-traumatic injury that required fixation or reconstruction using instrumentation.

c. Specific Physical Exam Findings:

Local pain to palpation, swelling, erythema.

d. Diagnostic Testing Procedures:

Radiographs, tomography, CT scan, MRI.

e. Non-operative Treatment:

Active and/or passive therapy for local modalities, activity modification. Nonsteroidal Anti-Inflammatory Drugs (NSAIDs).

f. Surgical Indications:

Persistent local pain, irritation around hardware.

g. 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.

h. 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: 6 to 8 weeks with progression to home exercise and or aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

3. **MANIPULATION UNDER ANESTHESIA**: (Refer to Section E.2. Adhesive Capsulitis/Frozen Shoulder Disorder)

4. **OSTEOARTICULAR ALLOGRAFT TRANSPLANTATION (OATS) PROCEDURE AND OTHER CARTILAGE TRANSPLANTATION PROCEDURES**:

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 (Kropf, 2007; Chapovsky, 2005).

Cases with cartilaginous damage to both the humeral head and the glenoid fossa, or larger areas of damage, tend to have more complications and worse outcomes with or without treatment. There is no evidence to support osteochondral allograft transplantation, nor autologous chondrocyte implantation in the shoulder (Gross, 2012). Debridement and microfracture are commonly performed, especially when cartilage damage is found during other procedures and are acceptable procedures in these cases. At this time, there is limited information concerning the effectiveness of OATS and appropriate application.

Implantation and transplantation require prior authorization or are ***not generally recommended***. They may be appropriate for younger active patients with full thickness cartilage damage who would otherwise qualify for hemiarthroplasty. Hemiarthroplasty or total shoulder replacement are ***not recommended*** for younger patients (Elser, 2010).

5. **RECOMBINANT HUMAN BONE MORPHOGENETIC PROTEIN (RHBMP-2)**: RhBMP-2 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 (Dimitriou, 2005; Evans, 2004). Ectopic ossification into adjacent muscle has

been reported to restrict motion in periarticular fractures ([Wysocki, 2007](#)). Due to lack of information on the incidence of complications and overall success rate, it is ***not recommended***.

No randomized trials of rhBMP-2 for humerus fractures have been found at the time of this guideline publication. Currently, there is a paucity of evidence for its use in fractures of the upper extremity.

6. SHOULDER REPLACEMENT (ARTHROPLASTY):

a. 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; and 3) the reverse arthroplasty in which the head of the humerus is replaced by a prosthesis forming a socket and the glenoid is replaced with a ball prosthesis.

b. Occupational Relationship:

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

c. Specific Physical Exam Findings:

Stiff, painful shoulder with limited function.

d. Diagnostic Testing Procedures:

Radiographs or CTs demonstrating humeral head fracture. CTs 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.

e. 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 functional outcomes are better at two years for total shoulder arthroplasty as compared with hemiarthroplasty in patients with glenohumeral osteoarthritis ([Cochrane] [Singh, 2010b](#)).

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.

Informed decision making should be documented for all invasive procedures. This must include a thorough discussion of the pros and cons of the procedure and the possible complications as well as the natural history of the identified diagnosis. Since most patients with the most common conditions will improve significantly over time, without invasive interventions, patients must be able to make well-informed decisions regarding their treatment.

Allergy to implant components can play a role in arthroplasty failure. Pre-operative screening of patients with the following questions is suggested:

1.   Do you have an allergy to metal, such as nickel?

2.   Have you ever had a rash or itching under jewelry, jean snaps, or watchbands?

3.   If you have ever worn artificial nails, did you ever have a skin reaction?

4.   Have you ever developed a rash from topical antibiotics, such as Neosporin?

If there are positive or equivocal responses to any of the questions, patch and or lymphocyte proliferation testing is recommended in advance of surgery.

Because smokers have a higher risk of delayed bone healing and post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively. If a treating physician recommends a specific smoking cessation program peri-operatively, this should be covered by the insurer. Physicians may monitor smoking cessation with laboratory tests such as cotinine levels. The surgeon will make the final determination as to whether smoking cessation is required prior to surgery.

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 good evidence that functional outcomes are better at two years for total shoulder arthroplasty as compared with hemiarthroplasty in patients with glenohumeral osteoarthritis ([Cochrane] Singh, 2010b). In younger active patients the eventual wear on the glenoid cartilage may cause decreased function over time (Parsons, 2004). 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 or osteonecrosis of the humeral head (Uribe, 2009; Bailie, 2008).

A large follow-up of more than 1000 cases found that total shoulder arthroplasty function was better than hemiarthroplasty at one year and that resurfacing hemiarthroplasty appeared better at one year than stemmed hemiarthroplasty (Rasmussen, 2014a). The revision rate for resurfacing hemiarthroplasty was 10% at 5 year follow-up and patients younger than 55 had a worse functional score than older patients (Rasmussen, 2014b). A small follow-up of ten patients with hemiarthroplasty versus total shoulder replacement (TSR) found no statistical difference in pain or function although more TSR patients were pain free. Glenoid erosion resulted in reversion to TRS for 1/3 of the hemiarthroplasty patients (Sandow, 2013).

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. In one study overall total shoulder arthroplasty success was good with an 85% 15-20 year survival rate (Killian, 2012). Another study reported secondary rotator cuff dysfunction at initially low levels but increasing to 55% at 15 years (Young, 2012). Consideration of metal allergies and testing is recommended prior to surgery for appropriate patients.

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. Good recovery of active elevation can be expected (Drake, 2010; Muh, 2013).

Reverse arthroplasty 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 (Drake, 2010). Older patients report similar activity levels after reverse arthroplasty compared to those with total or hemiarthroplasty. Fifty-three percent of patients with reverse arthroplasty are able to perform high demand activities. The most common complaint was inability to reach overhead (Lawrence, 2012).

A) Indications include massive rotator cuff tear with inability to flex anteriorly, chronic pseudoparalysis due to massive tears, humeral malunion, and failure of previous arthroplasty. This procedure is generally limited to patients older than 65 with low physical demands. Patient satisfaction is higher if pre-operative flexion is less than 90º. Internal rotation is usually limited post-operatively (Smith, 2012c).

B) Post-operative care: Patients must understand that full compliance with post-operative limitations is absolutely required to prevent dislocation and other complications. The patient may not fully extend the elbow for 6-12 weeks post-operatively.

C) Contraindications: Deltoid function is a requirement for the procedure; therefore, severe impairment of deltoid contraction is a contraindication. If only the supraspinatus is torn in an arthritic shoulder, a total shoulder arthroplasty, rather than a reverse arthroplasty, is appropriate. If a patient with a massive rotator cuff tear can nevertheless elevate the shoulder, nonoperative treatment such as NSAIDs and steroid injections are preferable to surgery (Drake 2010).

iv. Procedural complications of hemiarthroplasty or total arthroplasty 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.

f. **Operative Treatment**:

Prosthetic replacement of the articular surfaces of the shoulder.

g. **Post-operative Treatment**:

i. Individualized rehabilitation program will be based on communication between the surgeon and the therapist. Timing of passive motion and active rehabilitation is dependent on the type of procedures performed.

- Aquatic exercises 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 (Boardman, 2001).

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

  ❖ Time frames for therapy (excluding aquatic 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. The injured worker should adhere to the written return to work restrictions not only in the workplace, but at home and for 24 hours a day.

7. **INTERSCALENE ANESTHESIA**:

Interscalene anesthesia is generally performed for surgical procedures such as subacromial debridement with or without rotator cuff repair. There is some evidence that interscalene regional anesthetic block (ISB) at the time of elective arthroscopic rotator cuff repair results in faster hospital discharge than general anesthesia, therefore ISB is recommended, provided the following precautions are taken (Salviz, 2013).

Interscalene brachial plexus blocks (ISBs) almost always cause hemidiaphragmatic dysfunction acutely (Urmey1991) which causes respiratory impairment (Urmey, 1992). This can be symptomatic (Kayerker, 1983). Smaller volumes (Lee, 2011a) and lower concentrations of bupivacaine may be preferable (Thackeray, 2013). Permanent injury of the phrenic nerve has been reported rarely (Kaufman, 2013). Permanent or temporary paralysis of the hemidiaphragm can cause significant respiratory impairment, particularly in those with underlying lung disease. There is some evidence that in the setting of elective shoulder surgery when interscalene brachial plexus block is being used for anesthesia, and in the absence of chronic pulmonary or cardiac disease, needle guidance with ultrasound reduces the risk of diaphragmatic paresis in comparison to nerve stimulation guidance (Renes, 2009).The use of ultrasound guidance on all ISBs is encouraged. Alternative blocks and/or pre-operative pulmonary evaluation should be considered in patients with underlying lung disease and in smokers.

There is some evidence that continuous ISB for 48 hours is associated with somewhat greater pain relief at the seventh postoperative day than single injection ISB, but there is little if any difference in the use of opioids at that time between continuous and single

injection anesthesia ([Salviz, 2013](#)). There is no convincing evidence that continuous ISB is advantageous and due to the higher cost of ISB and the common respiratory compromise that may be prolonged with continuous use, continuous ISB is ***not recommended***.

8. **CONTINUOUS SUBACROMIAL ANESTHESIA INJECTION:**

There is some evidence that in the setting of arthroscopic rotator cuff repair, a subacromial infusion of 4 ml/hour of 0.5% bupivacaine for 50 hours does not reduce post-operative pain or oxycodone consumption in a clinically meaningful way ([Schwartzberg, 2013](#)). Therefore, it is ***not recommended***.

SHOULDER INJURY
AREAS OF RESEARCH
(Adopted December 8, 2014)
BIBLIOGRAPHY

The bibliography for the Shoulder Injury Medical Treatment Guidelines reflects the articles, abstracts, and literature reviewed during the Shoulder Injury update process. Approximately 596 articles and literature were examined for consideration during the course of this update.

Literature that was used to support evidence statements is listed in the bibliography.   A limited number of articles qualified for evidence statements. The designated strength of the evidence (eg. some, good, strong) may not coincide with acceptability of treatment. Each level of evidence was assigned in accordance with the related Assessment Criteria. Where applicable, literature was given a designation of one of the following: high quality, adequate, inadequate, or not applicable. It should be noted that some articles might have more than one assigned level, such as, 'adequate' on one concept and 'high-quality' on another concept.

When the evidence is conflicting or inconclusive, acceptability of treatment is determined by a combination of available medical literature and group consensus. Some of the elements that are considered in making consensus determinations are: level of functional benefit, acceptable risk/morbidity/mortality, and acceptable cost.

A review of the Shoulder Injury Medical Treatment Guidelines bibliography needs to coincide with a review of the General Guidelines Principles. In particular, please review Guidelines Principle #12: Guidelines Recommendations and the Strength of Medical Evidence and Consensus Recommendations. All recommendations in the guidelines are considered to represent reasonable care in appropriately selected cases, regardless of the level of evidence or consensus attached to it. Those procedures considered inappropriate, unreasonable, or unnecessary are designated in the guideline as 'not recommended.'

To access the medical treatment guidelines methodology and article critiques: Click Here

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