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Evidence Summary: Thoracic Outlet Syndrome and Shoulder Injury Medical Treatment Guidelines 2014

This table contains summaries of the critiques that were completed for individual scholarly articles used in the Thoracic Outlet Syndrome and Shoulder Injury Medical Treatment Guidelines. Scholarly articles were given an assessment of *"adequate," "inadequate,"* or *"high quality."* When Division of Workers' Compensation staff completed additional statistical pooling, this is noted in the "Division Staff Assessment Column" using RevMan (Cochrane Collaboration of Systematic Reviews). These are denoted with a **. In multiple cases, literature from the Cochrane Collaboration was reviewed.

It should be noted that one scholarly article may be graded at different levels for different interventions. For those deemed inadequate, a brief rationale is provided. The criteria for the aforementioned assessment designations are located on the Division of Workers' Compensation Website: www.colorado.gov/pacific/cdle/guidelines-methodology-article-critiques. Or alternatively, www.colorado.gov/cdle/dwc (then go to "Treatment Guidelines").

The articles that are graded as either adequate or high quality are then translated into **"some evidence," "good evidence," and "strong evidence"** as defined in the General Guidelines Principles, located in each of the Division Medical Treatment Guidelines.

- "Some" 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" 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" 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.

Because we synthesize the medical evidence as much as possible, one assessment (or group of assessments) may potentially create more than one evidence statement. It is also possible that two assessments may be combined (eg. two "adequates" to create a higher level of evidence, (for example, elevating a statement from "some" to "good" evidence). It should also be noted that some scholarly literature that focuses on the cervical spine may also be clinically applicable to care of the injured worker with disorders of the lumbar spine.

This evidence table is a *summary* and based on critiques of scholarly articles. The full critiques are publicly available on the Division of Workers' Compensation Website. www.colorado.gov/cdle/dwc. These critiques outline the available evidence in the areas of Diagnostic Procedures; Non-operative Procedures; Operative procedures, and exposure/occupational relationship.

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
Abrams, 2014	**Arthroscopic Repair**	Randomized clinical trial	**N=** 95. Subjects treated for full-thickness rotator cuff tears	UCLA; SST; ASES	No difference was shown in clinical outcomes of arthroscopic repair of full thickness rotator cuff tears between patients who did and did not have acromioplasty	Adequate on 2 issues; inadequate on another issue (additional reference) (**Statistical pooling done)
Two Related Evidence Statements: 1) 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. 2) There is 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.						
Abrisham, 2011	laser therapy with exercise	Randomized clinical trial	**N=80. Subjects diagnosed with subacromial syndrome**	(VAS) and shoulder range of motion (ROM)	Laser plus exercise therapy was more effective than exercise therapy alone in the reduction of pain and the improvement of active and passive ROM in patients with subacromial syndrome (rotator cuff and biceps tendinitis.	Adequate (**additional statistical pooling done)
Related Evidence Statement: There is good evidence that a clinically important effect of low level laser therapy on pain and range of motion is unlikely.						
Akyol, 2012	microwave diathermy, superficial heat, and an exercise program	Randomized clinical trial	**N=40. Subjects with unilateral shoulder pain consistent with subacromial impingement syndrome (SIS) for at least 3 months**	VAS; SPADI; SDQ; muscle strength; ROM; Short Form 36 (SF-36; BDI.	Differences between the treatment group and the control group on pain, ROM, disability, shoulder muscle strength, quality of life, and depression after 3 weeks of treatment in patients with subacromial impingement	Adequate

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					syndrome.	
Related Evidence Statement: 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						
Alvarez, 2005	**Subacromial Injection of Betamethasone and Xylocaine**	Randomized Clinical Trial	**N=** 62. Subjects were identified by history of pain in shoulder and/or lateral deltoid area with overhead activity, and by physical exam findings	VAS	Addition of betamethasone to lidocaine did not improve health-related quality-of-life scores 6 months after injection	Adequate
Bal, 2009	laser therapy	Randomized clinical trial	**N=40. Subjects with newly diagnosed subacromial impingement**	VAS; SPADI; UCLA	Combination of laser therapy and a home exercise program was nearly as effective as the home exercise program alone in the treatment of SIS	Adequate
Related Evidence Statement: There is good evidence that a clinically important effect of laser on pain and range of motion is unlikely						
Bang, 2000	**Supervised Exercise With and Without Manual Physical Therapy**	Randomized clinical trial	**N=** 52. Subjects treated for shoulder complaints	isometric strength tests; difficulty with nine separate activities; VAS	Manual therapy combined with a home exercise program is more effective in improving pain, shoulder function, and strength than a similar exercise program under the direct supervision of a physical therapist	Adequate
Related Evidence Statement: 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.						
Barber, 2012	**Acellular Human Dermal Matrix Augmentation**	Randomized Evaluation	**N=** 42. Subjects treated for rotator cuff tears	MRI arthrogram assessment	Larger rotator cuff tears often fail to repair completely after surgery, but dermal matrix	Adequate

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					augmentation increases the rate at which MRA scans show intact cuffs more than one year after surgery (85%) compared to the control group intact cuff rate of 40%	
Related Evidence Statement: 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.						
Bennell, 2010	**standardized manual therapy and home exercise**	Randomized clinical trial	**N=** 120. Subjects treated for chronic rotator cuff disease	SPADI	Immediately after treatment, a realistic placebo treatment and an active treatment program produced generally similar benefits on shoulder pain and function (measured by the primary outcome instrument of the total SPADI), with more than a third of participants reporting a successful outcome	Inadequate
Bingol, 2005	**Low-Power Laser Treatment**	Randomized clinical trial	**N=** 40. Subjects with 3 months of shoulder pain	VAS; ROM	Laser shows few advantages over sham laser for nonspecific shoulder pain	Inadequate
Blaine, 2008	**Sodium Hyaluronate**	Randomized clinical trial	**N=** 660. Subjects treated for persistent shoulder pain	VAS; ROM	Patients with OA demonstrated significantly better pain responses to HA than those without HA, supporting the hypothesis that OA is a key factor in the therapeutic effects of HA	Adequate (additional references)
Related Evidence Statement: 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.						
Bloom, 2012	**Image-guided versus**	Meta-analysis	MEDLINE, EMBASE,	Overall pain	current evidence does not	Adequate

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	blind glucocorticoid injection	of controlled clinical trials	CINAHL, and the Cochrane Central Register. patients of any age with rotator cuff disease or adhesive capsulitis	measured by numerical or categorical rating scales,	confirm an advantage of ultrasound-guided imaging for improving the pain and functional outcomes of corticosteroid injections	additional references. **Statistical pooling done.
Related Evidence Statement: 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.						
Brox, 1999	**Arthroscopic surgery versus supervised exercises**	Randomized clinical trial	N= 125. Patients treated for stage II impingement	Neer shoulder score	Both surgery and supervised exercises are better than placebo for stage II impingement, and there are no significant differences between surgery and exercise	adequate
Buchbinder, 2004	**Arthrographic joint distension with saline and steroid improves function**	Randomized clinical trial	N= 46. Patients treated for painful stiff shoulder	SPADI; VAS; ROM	Shoulder joint distension with saline and steroid significantly improves function, pain, and range of motion after 3 weeks, and this is maintained at 6 weeks	Adequate
Related Evidence Statement: 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						
Cacchio, 2006	**Radial Shock Wave Therapy (RSWT)**	Randomized Clinical Trial	N= 90. Patients treated for symptomatic calcific shoulder tendinitis	UCLA; VAS	RSWT effectively reduces pain and improves function when used to treat calcific tendinitis of the shoulder	Adequate
Related Evidence Statement: There is some evidence that low energy radial shock wave therapy may be beneficial in the setting of calcific tendinitis						
Calis, 2011	Laser therapy; ultrasound; exercise	Randomized clinical trial	**N= 52. Subjects with shoulder pain**	VAS; Constant score; ROM	Laser and ultrasound as physical therapy treatments could not	Inadequate

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
			and diagnosed with subacromial impingement syndrome (SIS)		be found superior to each other in the treatment of subacromial impingement syndrome.	
Canadian Orthopaedic Trauma Society, 2007	**Plate fixation of displaced mid-clavicular fractures.**	Randomized clinical trial	N= 111. patients with completely displaced midshaft clavicular fractures	DASH; Constant score	Plate fixation of displaced midclavicular fractures produces functional outcomes and radiographic union superior to results of non-operative treatment	Adequate (Inadequate on another issue)
Chahal, 2012	**Anatomic Bankart Repair Compared With Nonoperative Treatment and/or Arthroscopic Lavage**	Meta-analysis of clinical trials	MEDLINE, EMBASE, CINAHL, LILACS, and the Cochrane Central Register of Controlled Trials through May 2011. Patients with instability (subluxation or dislocation)	Risk of bias criteria	Anatomic Bankart repair is clearly more successful than either arthroscopic lavage or nonoperative treatment in preventing recurrent instability two years after a first-time traumatic shoulder dislocation	High Quality (additional references) **additional statistical pooling done.
Chahal, 2012	**Subacromial Decompression in Patients Undergoing Arthroscopic Repair**	Meta-analysis of clinical trials	MEDLINE, EMBASE, CINAHL, LILACS, and the Cochrane	Risk of bias criteria	Based on current evidence, there is no difference in patient-reported outcomes of full thickness rotator cuff repair between patients who do and do not undergo acromioplasty at the time of operation	Adequate

Two Related Evidence Statements:

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

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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						
Chou, 2010	**sodium hyaluronate [SH] treatment**	Randomized clinical trial	N=51. Patients treated for shoulder pain	Constant and VAS scores	Subacromial injection of SH leads to better Constant and pain VAS scores than saline 6 weeks after treatment	Inadequate
Coombes, 2010	**corticosteroid injections and other injections**	Meta-analysis of randomized clinical trials	MEDLINE, EMBASE, CENTRAL, CINAHL, and the Physiotherapy Evidence Database; Patients with tendinopathy of the rotator cuff, elbow, knee, and ankle	Modified PEDro; or a qualitative system of strength of evidence was defined	There is strong evidence that steroid injection provides short term benefit for common tendinopathies	Adequate (Inadequate on another issue)
Related Evidence Statement: 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.						
Cuff, 2012	Early passive motion compared with a delayed protocol	Randomized controlled trial	**N= 68. Subjects undergoing arthroscopic rotator cuff repair**	ASES; SST; Patient-reported satisfaction; ROM	ROM and function all improved after arthroscopic rotator cuff repair at 12 months post op, regardless of early or delayed postoperative rehabilitation protocols.	Adequate
Related Evidence Statement: 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.						
de Carli, 2012	**Tenotomy or tenotomy/tenodesis**	Randomized clinical trial	N=65. Patients treated for rotator cuff tears	Constant score; SST	The main finding was the small difference between groups in functional recovery, patient satisfaction, and evaluation	Adequate

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
					scale scores	
Related Evidence Statement: 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.						
Dezaly, 2011	**Arthroscopic treatment of rotator cuff tear**	Randomized clinical trial	N= 127. patients (69 women, 58 men, mean age 68) treated for symptomatic rotator cuff tears	Constant scores	Rotator cuff repair with acromioplasty/tenotomy gave better one-year functional results than acromioplasty/tenotomy without repair in patients over 60	Adequate
Related Evidence Statement: 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						
Dogan, 2010	**Low laser therapy in subacromial impingement syndrome**	Randomized clinical trial	**N= 52. Subjects diagnosed with subacromial impingement syndrome**	VAS; ROM; SPADI	This study failed to demonstrate that low level laser therapy was more effective than placebo laser therapy in the reduction of pain and the improvement of ROM and functional status after 3 weeks of treatment	Adequate
Related Evidence Statement: There is good evidence that a clinically important effect of laser on pain and range of motion is unlikely.						
Ebenbichler, 1999	**Ultrasound Therapy**	Randomized clinical trial	N= 54. Patients with with 61 shoulders who completed treatment for calcific tendinitis	Constant scores	Ultrasound therapy alleviates symptoms in short term	Adequate
Related Evidence Statement: 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						
Finestone, 2009	**Bracing in external rotation**	Randomized clinical trial	N= 51. Patients treated for traumatic dislocation of the	Recurrent dislocation	After primary anterior dislocation of the shoulder, bracing for 3 to 4 weeks allows optimal soft tissue healing	Adequate

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
			shoulder			
Related Evidence Statement: 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						
Franceschi, 2008	**Rotator cuff, and SLAP lesion repair**	Randomized clinical trial	N= 63. patients treated for rotator cuff tears and Type II SLAP lesions	UCLA	The combination of LHB tenotomy with rotator cuff repair provides better clinical outcomes than SLAP lesion repair with rotator cuff repair in patients who have both a rotator cuff tear and a Type II SLAP lesion	Adequate
Related Evidence Statement: 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.						
Garofalo, 2010	**one-month continuous passive motion after arthroscopic rotator cuff repair**	Prospective randomized clinical trial	**N= 100. Subjects undergoing arthroscopic repair of a rotator cuff tear**	VAS; range of motion	The use of CPM is able to accelerate functional recovery, yielding better short-term results, whereas there were no statistically significant differences between the 2 intervention groups at long-term follow-up (12 months). The long-term results of the 2 interventions are the same.	Inadequate
Gartsman, 2004	**Arthroscopic rotator cuff repair with and without arthroscopic subacromial decompression**	Randomized clinical trial	N= 93 patients treated for rotator cuff tear	ASES	For full-thickness supraspinatus tear and type 2 acromion, subacromial decompression has no significant effect on outcome at 1 year	Adequate
Related Evidence Statement: 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						

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
year after surgery						
Gebremariam, 2011	**Surgical and Postsurgical Interventions for the Subacromial Impingement Syndrome**	Systematic review of randomized clinical trials	Patient population: patients with SIS not caused by trauma or any systemic disease. PubMed, EMBASE, the Cochrane library, PEDro, and CINAHL	Results on pain, function, or recovery with a minimum follow-up. methodologic quality with 12 items for scoring	There is no evidence that surgical treatment is superior to conservative treatment for SIS; because of lower costs and fewer complications, conservative treatment may be preferred to surgery	Adequate
Related Evidence Statement: 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						
Gerdesmeyer, 2003	**Extracorporeal Shock Wave Therapy [ESWT]**	Randomized clinical trial	N= 144 patients (mean age 50, 57 men, 87 women) with calcific tendinitis	Constant-Murley Score	ESWT has a beneficial effect on calcific tendinitis; high-energy appears to have an advantage over low-energy, but threshold energy is not defined	Adequate
Related Evidence Statement: 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						
Gialanella, 2011	**Corticosteroids Injection in Rotator Cuff Tears**	Randomized clinical trial	N=60 patients treated for symptomatic rotator cuff tears	Constant-Murley Score	Intra-articular injection of TA improves pain relief in full thickness rotator cuff tears for up to three months	Adequate
Retated Evidence Statement: 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.						
Ginn, 2005	**Exercise Therapy for Shoulder Pain**	Randomized clinical trial	**N= 138. Subjects with unilateral shoulder pain of local mechanical origin with or without accompanying**	VAS	For participants with chronic shoulder pain with or without accompanying stiffness, exercises aimed at restoring dynamic stabilizing mechanisms and muscle coordination at the shoulder, or a single	Adequate (additional references cited).

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
			stiffness of at least one month		corticosteroid injection, or a combination of various physical modalities and ROM shoulder exercises each resulted in a significant reduction in pain and increase in function over a 5 week period.	
Related Evidence Statement: 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						
Habib, 2014	**Intra-articular methylprednisolone acetate injection at the knee joint**	Randomized clinical trial	N=40 patients treated for knee osteoarthritis	VAS; serum cortisol	An injection of 80 mg of MCA at the osteoarthritic knee was associated with laboratory evidence of adrenal insufficiency in 25% of patients, but no patient who had an injection of SH had lab evidence of loss of adrenal function	Adequate
Related Evidence Statement: 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.						
Handoll, 2004	**Surgical versus non-surgical treatment for acute anterior shoulder dislocation**	Meta-analysis of randomized clinical trials	MEDLINE, EMBASE, and CENTRAL	Risk of bias assessed through application of the Cochrane criteria	No guidance can be obtained for the best method of surgery; the interventions were different in all the trials	High quality (Additional References) (**Additional Statistical Pooling done)
Related Evidence Statement: 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.						
Hanratty, 2012	**Exercise**	Systematic Review and meta-analysis of randomized clinical trials	**Databases included MEDLINE, EMBASE, CINAHL, Allied and Complementary Medicine Database,**	van Tulder Criteria and the Cochrane Risk of Bias Tool were used to assess the quality	Overall, exercise is effective at reducing pain and improving function for the 6 to 12-week period following treatment, but is said cautiously, since it is	Adequate (**additional statistical pooling). Additional

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			Cochrane Central Register of Controlled Trials, Pedro, ProQuest Health and SPORTDiscus, Index to Theses, and openSIGLE databases through August 2010	and the risk of bias for the studies.	supported by only 6 medium and 4 high-quality RCTs.	References cited
Related Evidence Statement: There is good evidence that exercise provides moderate improvement in strength in the short-term.						
Hegedus, 2008	**Physical examination tests of the shoulder**	Meta-analysis of diagnostic tests	N= 45 articles evaluating physical examination tests of the shoulder, selected from 922 electronically retrieved abstracts and hand searches	QADAS	Very few physical examination signs appear to be diagnostically discriminatory and most are not useful in the clinic	Inadequate
Henkus, 2006	Accuracy of subacromial bursa injections is limited	Randomized clinical trial	33 patients with subacromial pain	SST; VAS; Constant Score	The accuracy of subacromial bursa injections is limited	Adequate
Related Evidence Statement: There is some evidence that in the setting of non-traumatic subacromial impingement syndrome, bursectomy can decrease shoulder pain and improve function						
Henkus, 2009	**Bursectomy compared with acromioplasty in the management of subacromial impingement syndrome.**	Randomized clinical trial	N=57 patients treated for symptomatic subacromial impingement syndrome	VAS; The Constant scores	Both bursectomy and bursectomy with added acromioplasty led to improved clinical scores; group differences were small and clinically unimportant	Adequate

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
Two Related Evidence Statements: • There is some evidence that in the setting of non-traumatic subacromial impingement syndrome, bursectomy can decrease shoulder pain and improve function. • There is also some evidence that adding acromioplasty to bursectomy is not likely to significantly enhance the outcome of surgery.						
Hodgson, 2007	**Rehabilitation of two-part fractures of the neck of the humerus**	Randomized clinical trial	N= 74 patients with minimally displaced proximal humerus fractures treated in a shoulder and elbow unit	Croft shoulder disability questionnaire	After minimally displaced proximal humerus fracture, immediate PT leads to faster recovery than delayed PT	Adequate
Related Evidence Statement: 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						
Holmgren, 2012	**Specific exercise strategy**	Randomized controlled trial	**N=102. Subjects on a waiting list for arthroscopic subacromial decompression**	Constant-Murley	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.	Adequate
Related Evidence Statement: 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.						
Jakobsen, 2007	**Primary Repair Versus Conservative Treatment of Anterior Dislocation of the Shoulder**	Randomized clinical trial	N= 76. Patients treated by 13 university-affiliated surgeons for first-time anterior shoulder dislocation	Oxford self-assessment score	Open repair of first time dislocation yields superior results compared to conservative treatment, and should be considered in active patients to reduce the risk of	Adequate

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					recurrence	
Related Evidence Statement: 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.						
Jeffcoach, 2014	**Nonsteroidal anti-inflammatory drugs' impact on nonunion and infection rates**	Retrospective cohort study	N= 1901 patients treated for long bone fractures	complication rates	NSAIDs increase the risk of poor bone healing when administered early in the treatment of long bone fractures	Adequate
Two Evidence Statements: • 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. • 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						
Johansson, 2011	**Subacromial corticosteroid injection or acupuncture**	Randomized controlled trial	**N= 117. Subjects with shoulder pain located in the deltoid area**	the patients' global assessment of change	Neither treatment was superior in decreasing pain and improving shoulder function. Both treatments showed a significant positive change	adequate
Kesikburun, 2013	**Platelet-Rich Plasma Injections**	Randomized clinical trial	N= 40 patients treated for rotator cuff tendinopathy	WORC	PRP in a single injection was not superior to saline injection for chronic rotator cuff tendinopathy	High quality
Related Evidence Statement: 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.						
Ketola, 2009	**Arthroscopic**	Randomized	N= 140 patients	Neer's test, passive	By 24 months, a structured	High Quality

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	acromioplasty	clinical trial	treated for shoulder impingement syndrome	ROM and muscle strength were measured, SDQ	exercise program and a treatment program combining acromioplasty and exercise produce very similar degrees of pain relief	
Related Evidence Statement: 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						
Kukkonen, 2014	**Physical Therapy**	randomized clinical trial	N= 180. Shoulders evaluated for treatment of rotator cuff tears	Constant score	Surgical repair of the rotator cuff does not improve the Constant score compared to acromioplasty and nonoperative treatment with exercise supervised by a physiotherapist	**Adequate (additional reference)**
Related Evidence Statement: 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						
Kwon, 2013	**Sodium hyaluronate**	Randomized clinical trial	N=300 patients (164 men, 136 women, mean age 66) treated for glenohumeral OA in a multicenter clinical trial in the United States (original cohort had 300 patients)	VAS	For OA of the glenohumeral joint without other shoulder pathologies, there was a greater reduction with HA than with saline	Adequate (additional references)
Related Evidence Statement: 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.						
Lee, 2011	**Botulinum Toxin Type B**	Randomized clinical trial	N= 61 patientstreated for	NRS; DASH; ROM	BTX B showed more persistent benefits in pain reduction and	Adequate

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			symptoms consistent with subacromial impingement syndrome		shoulder function than triamcinolone in patients with subacromial bursitis or impingement syndrome	
Related Evidence Statement: 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, 2012	Aggressive vs. Limited early passive exercises after arthroscopic rotator cuff repair	Randomized controlled trial	N= 64. Subjects undergoing arthroscopic repair of a rotator cuff tear	VAS; ROM	Pain, ROM, muscle strength, and function all significantly improved after arthroscopic rotator cuff repair, regardless of early postoperative rehabilitation protocols.	Adequate
Related Evidence Statement: 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.						
Lenza, 2013	**Surgical versus conservative interventions**	Meta-analysis of randomized clinical trials	Databases included MEDLINE, EMBASE, LILACS, and CENTRAL. N=555. Patients: adolescents (age >10) and adults diagnosed with middle third clavicle fractures	Function/disability, pain, therapeutic failure	Low-quality evidence from the included trials indicate that surgery may not result in a significant functional improvement or a significant pain reduction in comparison to conservative treatment	Adequate
Related Evidence Statement: 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.						
Lenza, 2013	**Magnetic resonance imaging, magnetic**	Meta-analysis	Electronic databases included MEDLINE,	diagnostic test accuracy, including	For full thickness tears, MRI, MRA, and US perform well as	high-quality (**statistical

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
	resonance arthrography and ultrasonography		EMBASE, LILACS, and the Cochrane Register of Diagnostic Test Accuracy Studies . People with shoulder pain suspected of having a rotator cuff tear for whom surgery was being considered	sensitivity, specificity, positive likelihood ratios, and negative likelihood ratios;	diagnostic tests, and any one of them could be used in patients in whom surgery is being considered	pooling and references)
Related Evidence Statement: 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.						
Lubbert, 2008	**Low-intensity pulsed ultrasound (LIPUS)**	Randomized clinical trial	N= 101 patients treated for radiographically confirmed, isolated, closed midshaft clavicle fractures	VAS; Analgesic use	LIPUS does not influence the time to clinical healing of fresh midshaft clavicular fractures, and does not influence analgesic use or resumption of activity	high quality
Related Evidence Statement: There is good evidence that low-intensity pulsed ultrasound (LIPUS) does not influence the healing of new non-displaced mid shaft clavicle fractures.						
MacDonald, 2011	**Arthroscopic Rotator Cuff Repair**	Randomized clinical trial	N=86. patients (56 men, 30 women, mean age 57) treated for full-thickness rotator cuff tears in university orthopedics departments in Winnipeg and	WORC; ASES	In patients undergoing arthroscopic repair of full-thickness tears, the patient-reported outcomes with and without acromioplasty are similar	high quality

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
			Ottawa			
Related Evidence Statement: • 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 • 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						
Maenhout, 2013	**heavy load eccentric training**	Randomized controlled trial	**N=61**	SPADI	A 12-week traditional rotator cuff home training exercise protocol combined with 9 physiotherapy treatments was successful in increasing isometric strength and decreasing shoulder pain and dysfunction in patients with subacromial impingement. Adding heavy load eccentric training resulted in a higher gain of isometric strength at 90° of scapular abduction.	Adequate
McKee, 2012	**Operative Versus Nonoperative Care**	Meta-analysis of randomized clinical trials	N=634. patients with acute, completely displaced midshaft fractures of the clavicle; MEDLINE	Constant Shoulder Score, (DASH), an Italian shoulder rating questionnaire, and the Single Assessment Numeric Evaluation	Although most nonoperated fractures did well, surgical repair of the fractures had lower rates of nonunion and symptomatic malunion during the first year after the injury	high quality (**statistical pooling done; additional references reviewed)

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
Related Evidence Statement: 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						
Min, 2013	**subacromial injection with corticosteroid versus NSAID**	randomized clinical trial	N= 32 patients (25 men, 7 women, mean age 39) treated for symptomatic shoulder impingement	UCLA; VAS	NSAID injection had better efficacy than steroid injections as measured by the UCLA score at the four week followup, perhaps due to a greater anti-inflammatory action of ketorolac	Adequate (additional reference)
Related Evidence Statement: 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						
Mirzatolooei, 2011	**operative and nonoperative treatment methods**	Randomized clinical trial	N= 50 patients (treated for comminuted fractures of the clavicle	DASH; Constant shoulder score, patient satisfaction; ROM;\	Compared to closed treatment of comminuted midshaft clavicle fractures, ORIF reduces pain at one year after the fracture and its treatment	Adequate
Related Evidence Statement: 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.						
Moosmayer, 2010	**surgery and physiotherapy**	Randomized clinical trial	N= 103 patients treated for rotator cuff tears	ASES; MRI	For small and medium-sized tears of the rotator cuff, the between-group difference in the primary outcome was clinically relevant	High quality
Related Evidence Statement: 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.						
Moraes, 2013	**Platelet-rich therapies**	Meta-analysis of randomized clinical trials	Databases included MEDLINE, the Cochrane Register,	functional evaluation scores such as DASH; VAS;	There is very low quality evidence, from a diverse collection of small trials, for a	High quality (additional references done)

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
			EMBASE, and other electronic databases through March 2013. people with musculoskeletal soft tissue injuries being treated either surgically or conservatively		marginal short-term pain relief effect of PRT in a variety of musculoskeletal soft tissue injuries	
Related Evidence Statement: 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.						
Pan, 2003	**Extracorporeal Shock Wave Therapy**	Randomized clinical trial	N= 60 patients with radiographically and sonographically verified calcific tendinitis	Constant-Murley test; VAS; motor strengthmotor strength	ESWT more effective than TENS to achieve functional improvement and alleviate pain in calcific tendinitis of shoulder	Adequate
Related Evidence Statement: 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.						
Penning, 2012	**injections of hyaluronic acid or corticosteroid**	randomized clinical trial	N= 159 patients treated for shoulder impingement	VAS	Steroid injection was associated with faster reduction of pain than for either hyaluronate or saline, but at 26 weeks there were no group differences	high quality
Related Evidence Statement: 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						
Renes, 2009	**Ultrasound-Guided Low-Dose Interscalene Brachial Plexus Block**	randomized clinical trial	N=30 patients undergoing elective shoulder surgery	Diaphragmatic motion with real-time M-mode ultrasonography in an upright sitting position,	When ISB is being used in the setting of elective shoulder surgery, US guidance for needle placement significantly reduces the incidence of diaphragmatic paresis compared with the use of NS for needle placement	adequate

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
Related Evidence Statement: 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						
Rha, 2013	**ultrasound-guided platelet-rich plasma injection and dry needling**	Randomized clinical trial	N= 39 patients (17 men, 22 women, mean age 53) treated for supraspinatus tendinopathy at a university department of physical medicine in Seoul	SPADI; ROM	Both PRP and dry needling had therapeutic benefits from the procedure, but the effect was greater for the PRP group	Adequate
Related Evidence Statement: 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.						
Rhon, 2014	**Corticosteroid Injection Compared With Manual Physical Therapy**	Randomized clinical trial	N= 98 patients treated for shoulder impingement	SPADI; NPRS; GRC	Manual PT and corticosteroid injections produce similar improvement in pain and function beginning at 1 month and continuing through 12 months in patients with unilateral shoulder impingement syndrome	Adequate (additional references)
Related Evidence Statement: 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						
Salviz, 2013	**Continuous Interscalene Block**	Randomized clinical trial	N= 63 patients who had elective arthroscopic repair	pain on postoperative day 7	Both CISB and SISB result in significantly faster discharge home and greater postoperative	Adequate

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
			of the supraspinatus tendon		analgesia compared to GA	
Two Related Evidence Statements: • 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.						
Schmitt, 2001	**Low-energy extracorporeal shock-wave treatment**	Randomized clinical trial	N= 40 patients (20 men, 20 women, mean age 52) treated for non-calcific tendinitis	Constant-Murley	ESWT is probably ineffective for noncalcific tendinitis	Adequate
Related Statement: In the absence of a documented calcium deposit, there is no evidence that ESWT is effective.						
Schwartzberg, 2013	**continuous subacromial bupivacaine**	Randomized clinical trial	N= - 88 patients operated on for rotator cuff tears	VAS	In the first 5 days following arthroscopic rotator cuff repair, there was no difference in pain VAS scores between no catheter, catheter plus saline, and catheter plus bupivacaine	Adequate
Related Evidence Statement: 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.						
Shin, 2012	**Acromioplasty**	Randomized clinical trial	N=120 patients treated for full thickness rotator cuff tears	VAS, ASES, UCLA, and Constant scales; ROM	Arthroscopic repair of small to medium-sized full thickness rotator cuff repairs was successful in both groups. Acromioplasty did not lead to better outcomes in the patients who underwent the procedure	Adequate

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
Related Evidence Statement: 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.						
Singh, 2010	**Surgery for shoulder osteoarthritis**	Meta-analysis of randomized clinical trials	N= 1339. Adults with radiographically confirmed osteoarthritis (OA) of the shoulder. MEDLINE, CINAHL, OVID SPORTdiscus, EMBASE, Cochrane Central Register of Controlled Trials, and Web of Science	Constant, ASES, UCLA, DASH, WOMAC, VAS	There were no randomized trials comparing surgery to nonsurgical treatment for shoulder OA, and the benefits of surgery versus nonoperative treatments are not known	High quality
Related Evidence Statement: 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						
Smith, 2012	**diagnostic test accuracy of MRA and MRI for the detection of glenoid labrum injury**	meta-analysis of the accuracy of diagnostic tests	N= 296. Databases included MEDLINE, EMBASE, CINAHL, the Cochrane Register of Controlled Trials,	comparative test accuracy of MRI and MRA using sensitivity and specificity as criteria of accuracy	The overall accuracy of MRA is superior to that of MRI for the detection of glenohumeral labral lesions	High quality (additional references reviewed).
Related Evidence Statement: There is good evidence that MRA is marginally more sensitive and specific for the detection of many glenohumeral labral lesions, including SLAP lesions.						
Struyf, 2013	scapular-focused treatment	Randomized controlled trial	**N= 22. Subjects with shoulder impingement syndrome**	SDQ	A scapular focused exercise treatment protocol that includes motor control exercises, scapular mobilizations, and stretching is effective for reducing pain and	Adequate

First Author, Year	Intervention	Design	**Population/Sample**	Main Outcome Measures	Author (s)Conclusion	Division Assessment
					disability in patients with shoulder impingement syndrome.	
Related Evidence Statement: 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						
Svendsen, 2004	**Work Above Shoulder Level**	Cross-sectional study	N= 136 men from three trade groups	Dominant shoulder images	Arm elevation above 90° increased the frequency of supraspinatus tendinitis as seen on MRI, with a tendency toward higher grades of tendinopathy with increasing exposure	Adequate (additional references)
Related Evidence Statement: 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						
Yeldan, 2009	low level laser therapy in addition to an exercise program on shoulder function	Randomized clinical trial	**N= 60. Subjects with subacromial impingement syndrome**	VAS; Constant-Murley; DASH; SDQ	Both groups showed similar improvements in outcome measurements of pain, ROM, shoulder function and disability, and there were no significant differences between the two groups after the treatment.	Adequate (additional reference)
Related Evidence Statement: There is good evidence that a clinically important effect of low level laser therapy on pain and range of motion is unlikely						
Zhang, 2013	**Tenotomy or tenodesis**	Randomized clinical trial	N= 151 patients treated for LHB lesions with reparable rotator cuff tears	Constant score	Tenotomy and tenodesis of the LHB yield equally satisfactory outcomes 2 years after being done in association with rotator cuff repair	High quality
Related Evidence Statement: 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.						

Acronyms: Qadus; Western Ontario Rotator Cuff Index (WORC); NPRS; GRC;

RISK FACTORS/CAUSATION/PREVALENCE

1st Author/Year	Exposure/Condition	Design	Population/Sample/Setting	Main Outcome Measure(s)	Author(s) Conclusion(s)/ Discussion	Division Staff Assessment
Frost, 2002	**Shoulder Loads in Monotonous Repetitive Work.**	cross-sectional study	N= 2846 Workers in manual repetitive tasks with increased force requirements have an increased risk of shoulder tendinitis	The prevalence of dominant shoulder tendinitis	Workers in manual repetitive tasks with increased force requirements have an increased risk of shoulder tendinitis	Adequate
Miranda, 2008	**Physical work and chronic shoulder disorder**	Prospective population-based study	N=7217. Individuals with shoulder pain	standard clinical examination; detailed medical history from medical records on previous shoulder diagnoses; treatments, sick leave, and x-rays	Even after a followup period of 20 years, occupational physical exposures predicted future shoulder disorders	Adequate (Additional Reference)
Related Statement: 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						
Seidler, 2011	time working above shoulder level, work time physical workload including lifting and carrying, psychosocial	Case-control study	N=743	Cumulative duration of work with highly elevated arms.	Supraspinatus lesions are independently related to work above shoulder level as well as lifting/carrying of heavy loads and handheld vibration	adequate

1st Author/Year	Exposure/Condition	Design	Population/Sample/Setting	Main Outcome Measure(s)	Author(s) Conclusion(s)/ Discussion	Division Staff Assessment
	workload, leisure activities, life events, and medical complaints					
Related Evidence Statement: 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						
Svendsen, 2004	**Work Above Shoulder Level**	Cross-sectional study	N= 136 men from three trade groups	Dominant shoulder images	Arm elevation above 90° increased the frequency of supraspinatus tendinitis as seen on MRI, with a tendency toward higher grades of tendinopathy with increasing exposure	Adequate (additional references)
Related Evidence Statement: 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, 2004	**Work related shoulder disorders:**	Cross-sectional study	N= 72 men from three trade groups	signs of supraspinatus pathology; Constant score	Duration of employment was not associated with shoulder disorders because of the healthy worker survivor effect; healthy workers continue working, while workers with greater disability leave the workforce There were exposure-response relations for upper arm elevation above 90° and shoulder disorders which may have been underestimated because of the fact that the use of group averages rather than individual exposures could lead to misclassification of exposure at the individual level	Adequate (Additional References)
Related Evidence Statement: The study provides some evidence that upper arm elevation above 90° increases the odds of shoulder pain with disability,						

1st Author/Year	Exposure/Condition	Design	Population/Sample/Setting	Main Outcome Measure(s)	Author(s) Conclusion(s)/ Discussion	Division Staff Assessment
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)						
van Rijn, 2010	**work-related factors and specific disorders of the shoulder**	Systematic review of observational studies	N= 17. MEDLINE, EMBASE, and the Cochrane Register of Controlled Trials	Quality assessment was considered for 5 topics with 16 items	Subacromial impingement syndrome is associated with several work factors, including force requirements more than 10% of maximal voluntary contraction, lifting >=20 kg >= 10 times per day, high hand force more than 1 hour per day, repetitive movements of the shoulder >=2 hours per day, using a vibrating tool >=2 hours per day, upper-arm elevation >90° , working with hand above shoulder level >=1 hour per day, upper-arm flexion 45°, and other factors	Adequate (Additional References)