

Evidence Summary: Cervical Medical Treatment Guidelines

This table contains summaries of the critiques that were completed for individual scholarly articles used in the Cervical Spine Medical Treatment Guidelines. Scholarly articles are 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 lumbar spine may also be clinically applicable to care of the injured worker with disorders of the cervical 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.

Author/Year	Intervention	Design	Population/Sample/Sizing	Main Outcome Measure(s)	Author(s) Conclusion(s)/Discussion	Division Staff Assessment
Diagnostic Procedures						
Mahmud, et al. 2010	Functional Capacity Evaluation	Meta-analysis of randomized controlled trials	Injured workers or claimants of workers' compensation. -- Databases were searched through December 2009 and included the Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINAHL, PsycINFO, and PEDro	Any re-injury outcome measures after functional evaluation, such as time for RTW, days on sick leave, or duration of workers' compensation claims	-No studies were found which compared FCE to no intervention -Low quality evidence was found from one study that short form FCE results in similar recurrence rates to long form FCE; even though the study met nearly all criteria for validity, the overall findings were rated as low quality, since only one study was found	High Quality- additional references reviewed
Related Statement: A full review of the literature reveals that there is no evidence to support the use of FCEs to prevent future injuries						
Matheson, et al. 2002	Functional Capacity Evaluation (FCE)	Retrospective Study	N=650. Mean age 41.5. Individuals not working due to functional limitation. Canada	Measures of lifting ability. Time off work	The amount of time a worker was off from work and gender were the 2 factors that had the strongest relationships to whether or not a person returns to work, and time off work had the stronger relationship of the two. The amount of weight lifted from floor to waist was also related to return to work. This study showed that the greater the lifting ability, the greater the likelihood of return to work. All other performance variables did not provide any additional predictive power to the logistic regression	Adequate

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					model.	
Related Evidence Statement: <i>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</i>						
Rubinstein et al. 2007	Provocative tests for neck	Systematic Review	The authors did an electronic search of several databases through June 2005: MEDLINE, EMBASE, CINAHL, Medion, OSTMED, and DARE	Study quality was based on a commonly used tool to which examines numerous aspects of studies of diagnostic tests.	None of the tests had both high sensitivity and specificity Spurling's test, traction/neck distraction, and Valsalva show high specificity, and the upper limb tension test is reasonably sensitive	Adequate
Related Evidence Statement: <i>There is some evidence that Spurling's test, traction/neck distraction and Valsalva demonstrate high specificity. The upper limb tension test (ULTT) should be done with finger and wrist extension. There is some evidence that a negative ULTT can be used to rule out radiculopathy</i>						
Non-Operative Treatment						
Anderberg L, et al 2007	Steroids/anesthetics	Randomized clinical trial	N=40. Randomized clinical trial, mean age 51. Treated for cervical radiculopathy-Sweden	10 item questionnaire immediately prior to and 3 weeks after treatment.	No short-term difference between the combination of steroid and local anesthetics and the combination of saline and local anesthetics	Adequate
Related Evidence Statement: <i>Adequate for evidence that cervical transforaminal injection of anesthetic plus steroid is similar to injection of anesthetic plus saline for cervical radiculopathy</i>						
Aurora et al., 2011	Botulinum Toxin	Randomized clinical trial followed by open-label study	N=1384, mean age-41. 122 sites in 6 countries. Treated for migraine.	Change in frequency of headache days per month.	BTX safe and effective for long-term prophylaxis of migraine headache	Inadequate <i>Cumulative problems such as small effect size and potential compromise of blinding, enrollment. Additional reference(s) reviewed.</i>
Andersen, 2013	Exercise	Cluster Randomized Clinical Trial	N=118, mean age 42. Part of a larger study in Copenhagen. Treated with exercise program	Visual Analog Scale	There is a clinically relevant effect of resistance training for reducing severe neck pain.	Inadequate <i>[details of cluster randomization lacking] Additional</i>

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			for neck pain.			<i>reference(s) also used.</i>
Balthazard, et al. 2012	Manual Therapy/Active exercise	Randomized Clinical Trial	N=42, ages 20-65 with non-specific LBP, recruited from rheumatology clinic	VAS pain scale and Oswestry disability	Manual therapy followed immediately by active therapy accelerates recovery.	Adequate
Related Evidence Statement: <i>There is some evidence that manual therapy, followed by active exercises, may be effective for the reduction of disability from nonspecific low back pain lasting more than 12 weeks</i>						
Behrend, 2012	Smoking cessation	Prospective cohort study	5333 patients mean age 52.4) seen for cervical or lumbar spine care at two academic hospital centers at Universities of Florida and Texas	Oswestry	Smokers reported more pain than nonsmokers Smoking cessation prior to treatment or during the course of care was related to a greater improvement in reported pain compared to current smoking	Adequate
Related Evidence Statement: <i>There is some evidence that patients who smoke respond less well to non-operative spine care and that quitting smoking results in greater improvement</i>						
Borchgrevink GE, et al. (1998)	Acute Treatment	Randomized Clinical Trial	N=201. Age range 18-70; Neck sprain following car accident; Norway	VAS for head and neck pain; neurologic exam.	Usual activity group did better than soft collar immobilization, even though 10% of usual activity group still severely symptomatic at 6 months	Adequate
Related Evidence Statement: <i>There is some evidence that patients encouraged to continue usual activity have less neck stiffness and headache than patients placed in cervical collars and placed on sick leave following motor vehicle crashes</i>						
Brinkhaus B et al. 2006	Acupuncture	Randomized Clinical Trial	N= 298; mean age 59. Low Back Pain accd to VAS I past 7 days and use of only NSAID for pain in past 4 weeks.	Difference in VAS (pain relief) between baseline and 8 weeks	Acupuncture provides significant pain relief compared to no acupuncture for chronic low back pain Design was compromise between flexibility (desired by acupuncturists) and reproducibility (desirable for researchers)	Adequate; Inadequate regarding establishing that there is no difference between true and sham acupuncture.
Related Evidence Statement: <i>There is good evidence that both acupuncture and sham acupuncture are superior to usual care without acupuncture for moderate short-term and mild long-term alleviation of low back pain, neck pain, and the pain of joint osteoarthritis.</i>						
Bronfort,	Exercise, Spinal	Randomize	N=191; mean age-44	Patient-reported pain	Simple strengthening exercise combined	Adequate

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et. al. 2001	Manipulation Treatment (SMT)	d Clinical Trial		and functional health status on SF-36	with SMT more effective than SMT alone. High Tech strengthening more effective than SMT alone	
Related Evidence Statement: <i>There is good evidence that adding exercise in combination with other interventions such as: 1) manipulation alone, or 2) manipulation and mobilization, or 3) mobilization, muscle energy, and stretching, is more effective than manipulation alone, mobilization alone, exercise alone, and other minimal intervention or education alone in reducing neck pain and disability</i>						
Bronfort, et al. 2004 <i>Cochrane Collaboration</i>	Non-invasive physical treatment for chronic recurrent headache	Systematic Review of Clinical Trials	Patient Population- persons of any age with chronic recurrent headache; Thru November 2002 in MEDLINE; CINAHLs, Cochranes. 22 trials with total of 2628 patients with migraine, tension headache, cervicogenic and mixed	5 levels of evidence were defined ranging from strong to conflicting.	Heterogeneity of the studies included means that a few high-quality RCTs could readily change tentative conclusions of the efficacy of any of the interventions for headache. Spinal manipulation has moderate evidence of superiority to no spinal manipulation for cervicogenic headache	Adequate for more than one issue.
Related Evidence Statement: There is some evidence that spinal manipulation is effective for treatment of cervicogenic headaches. There is some evidence that exercise is equally efficacious as manipulation and can be used in combination with manipulation .						
Chan, et al, 2009	Electrical Acustimulation	Randomized Clinical Trial	N=49. Mean age-53. Patients with chronic neck pain in an outpatient facility in Hong Kong,.	Numerical Rating Scale (NRS); Neck Pain Questionnaire (NPQ); Pain Self-Efficacy Questionnaire (PSEQ).	Electrical acustimulation of the wrist improved pain and self-assessed disability compared to sham acustimulation at the end of 4 weeks of treatment and at the end of a 4 week follow-up period	Adequate
Related Evidence Statement: <i>There is some evidence that a combination of electrical acustimulation to the wrist combined with neck stretching and strengthening exercises for 30 minutes two times per week for a period of about four weeks demonstrates more improvement in chronic neck pain and patient self-confidence in performing functional activities than neck exercises alone for up to one month</i>						
Cherkin, et al. 1998	Physical Therapy, Education Booklet, Chiropractic Care	Randomized Controlled Trial	N=323. Mean age 41. Patients with low back pain at Group Health Cooperative of Puget Sound in Seattle	“Bothersomeness” of symptoms; and modified Roland-Morris Disability.	McKenzie PT and chiropractic manipulation produce marginal outcome advantages over booklet alone.	Adequate
Related Evidence Statement: <i>Some evidence that referral of patients in the first weeks of uncomplicated low back pain adds little to the otherwise favorable</i>						

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<i>prognosis for acute low back pain and does incur additional short-term costs of care</i>						
Cherkin et al. 2009	Acupuncture, Simulated Acupuncture, usual care	Randomized Clinical Trial	N=638. Mean age 47. With chronic low back pain. Kaiser & Group Health Cooperative in Seattle WA	VAS scale and Roland Morris Disability Scale	Compared to usual care, individualized, standardized, and simulated acupuncture led to greater improvements in pain bothersomeness and disability at 8 weeks	High Quality
Related Evidence Statement: <i>There is good evidence that acupuncture, true or sham, is superior to usual care for the reduction of disability and pain in patients with chronic nonspecific low back pain, and that true and sham acupuncture are likely to be equally effective</i>						
Cho, et al. 2013	Acupuncture	Randomized Clinical Trial	N=116. Mean age: 42. Patients with Low Back Pain. University Dept in South Korea	VAS "bothersomeness" score.	There is evidence that acupuncture at traditional meridian points individualized to the patient is more effective than sham acupuncture in reducing pain bothersomeness and pain intensity for nonspecific LBP	High quality (additional references reviewed).
Related Evidence Statement: <i>There is 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</i>						
Costa, et. Al. 2005	Botulinum Toxin A	Meta-analyses of Randomized Clinical Trials	13 Studies selected from the following databases: Cochrane Movement Disorders register, Cochrane Controlled Trials register, MEDLINE and EMBASE (1977 to June 2003); also various abstracts, personal communication. Patient population: Any with diagnosis of cervical dystonia.	Many analyses using different outcome definitions	BtA produced clinically and statistically significant improvements in pain and disability. Two large trials enrolled patients already known to respond to BtA; this is likely to improve the chances of a positive trial	Adequate; High Quality
Related Evidence Statement: <i>There is strong evidence that botulinum toxin A has objective and symptomatic benefits over placebo for cervical dystonia; There is good evidence that cervical botulinum toxin A injections cause transient dysphagia and neck weakness.</i>						
Cross, 2011, et. al	Thoracic spine thrust manipulation	Systemized Review of Randomize	Patients with mechanical neck pain. 6 RCTs met eligibility	Pain, range of motion, neck disability	Thoracic spine thrust manipulation reduced pain and improved ROM among patients with acute or subacute	Adequate Additional Reference

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		Randomized Clinical Trials	criteria. Databases : PubMed, CINAHL, Cochrane Library, PEDro, Sport Discus, and Web of Science from inception through October 2010		mechanical neck pain.	reviewed
Related Evidence Statement: There is <i>some evidence</i> that a program of 2 sessions of thoracic thrust manipulation followed by a cervical exercise program is more effective than a cervical exercise program alone						
Currie et al, 2000	Cognitive-Behavioral Treatment (CBT)	Randomized Clinical Trial	N=60. Mean age 45. Patients treated for insomnia in a facility in Ottawa.	Categories based on sleep diaries	CBT can relieve insomnia secondary to chronic pain. Even though complete remission of insomnia was not attained by most patients in the CBT group, it was possible to reduce the severity of insomnia with non-pharmacological interventions	Adequate
Related Evidence Statement: There is <i>some evidence</i> that CBT provided in seven two-hour small group sessions can reduce the severity of insomnia in chronic pain patients						
Daganais, et al. 2007	Prolotherapy	Systematic Reviews of controlled clinical trials.	Adults with history of non-specific low back pain lasting over 3 months. Databases included MEDLINE, EMBASE, CINAHL, AMED, and the Cochrane Central Register of Controlled Trials through October 2006	Low back pain, low back disability, general/overall improvement or satisfaction with treatment, well-being measured by SF-12, return to work, physical examination findings, medication/health care use	Even with studies of generally high quality, it is difficult to interpret evidence of the efficacy of prolotherapy injections for low back pain	High Quality; [additional reference(s) reviewed]
Related Evidence Statement: There is <i>good evidence</i> that prolotherapy alone is not an effective treatment for chronic low back pain						
Dobsha, et al. 2009	Collaborative Care for Chronic Pain	Cluster randomized trial	Patients with musculoskeletal pain diagnosis. 42 clinicians treating patients in the	Roland Disability score	Collaborative care intervention for chronic pain was significantly more effective than treatment as usual across a variety of outcome measures	Adequate -other references reviewed

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			Veteran's Administration in Portland Oregon.			
Related Evidence Statement: <i>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</i>						
Ernst et al 2011	Acupuncture	Systematic Review of Systematic Review	57 Systematic reviews. Literature searches	Predefined criteria from a 1991 article on systematic reviews were used to evaluate the quality of the systematic reviews	Of the 57 systematic reviews (SR) included in the study, only 4 were judged to be excellent	Adequate
Related Evidence Statement: <i>There is good evidence that both acupuncture and sham acupuncture are superior to usual care without acupuncture for moderate short-term and mild long-term alleviation of low back pain, neck pain, and the pain of joint osteoarthritis</i>						
Fishman, et al, 2002	BOTOX and physical therapy	Randomized Clinical Trial	N=67. Mean age 57. Patients with piriformis syndrome	50% pain reduction on VAS	BTX was more effective in treating piriformis syndrome than either placebo or triamcinolone plus lidocaine	Adequate
Related Evidence Statement: <i>There is some evidence to support injections for electromyographically proven piriformis syndrome</i>						
Fu, et al. 2013	Recombinant Human Bone Morphogenetic Protein-2 in Spine Fusion (RhBMP-2)	Meta-analysis of randomized clinical trials and cohort studies	Patients undergoing spinal fusion in trials sponsored by Medtronic, the manufacturer of INFUSE (rh-BMP-2)	Rating of the strength of evidence was based on risk of bias, consistency, directness, and precision of the data	In spinal fusion, rh-BMP-2 and ICBG seem to be similarly effective when used in ALIF and PLF; current evidence precludes conclusions about effectiveness in other surgical approaches	High Quality [additional reference(s) reviewed]
Related Evidence Statement: <i>There is good evidence that it increases the risks of dysphagia, dysphonia, and other postoperative complications in the setting of anterior cervical fusion</i>						
Fukusaki, et al 1998	Epidural Steroid Injection	Randomized Clinical Trial	N=53. Mean Age: 70. Patients with pseudoclaudication and leg pain at a University anesthesiology department in Japan.	Walking distance	Epidural anesthetic block has short-term beneficial effect on pseudoclaudication in lumbar degenerative stenosis, but addition of steroid confers no additional benefit	Adequate
Related Evidence Statement: <i>There is some evidence that translaminal steroid injections do not increase walking tolerance for those with spinal stenosis compared</i>						

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to local anesthetic						
Furlan, et al. 2008	Massage	Systematic Review of Controlled Clinical Trials	Databases included Cochrane Central Register of Controlled Trials, MEDLINE, CINAHL, EMBASE through 2008, HealthSTAR through 2006, hand search of reference lists in review articles and guidelines, and contact with experts in massage therapy and spine disorders. Patients with non-specific back pain between the 12 th rib and inferior gluteal fold.	Various risk of bias criteria. Levels of evidence as defined by study design, consistency of findings, directness (generalizability), precision of results, and risk of bias	Massage may be beneficial for patients with subacute and chronic low back pain, especially if combined with exercise and delivered by a licensed therapist	Adequate
<p>Related Evidence Statements:</p> <ul style="list-style-type: none"> • There is good evidence that massage therapy in combination with exercise reduces pain and improves function short-term for patients with sub-acute low back pain • There is some evidence that massage may be beneficial for low back pain, especially when combined with exercise 						
Gross, et al. 2010 <i>Cochrane Collaboration</i>	Manipulation or mobilization for neck pain	Meta-analysis of clinical trials	Adults with three selected categories of neck pain. Databases included MEDLINE, EMPASE, the Central Cochrane register, CINAHL, and the Index to Chiropractic Literature	After assessment of risk of bias, other considerations for quality of evidence were assessed using the GRADE (Grading of Recommendations Assessment, Development, and Evaluation) system, which considers the consistency, directness,	The quality of reporting of clinical trials for manipulation and mobilization has not improved in recent years. The available evidence suggests some immediate or short-term pain relief with cervical manipulation and mobilization alone, but there is no evidence for long-term relief	High Quality. Additional Reference Reviewed;

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				precision and reporting of studies.		
Related Evidence Statements:						
<i>Some evidence that manipulation provides immediate and short-term relief for acute and chronic neck pain</i>						
<i>Some evidence that manipulation and mobilization produce comparable relief of subacute and chronic neck pain in the short and intermediate term</i>						
<i>Some evidence that thoracic thrust manipulation may improve pain and function for mechanical neck pain</i>						
Haake, et al. 2007	Acupuncture	Randomized Clinical Trial	N=1162; Mean age-50. University of orthopedics and pain management in Germany	A "response" was defined as a 33% or better improvement on 3 pain-related items on the Von Korff CPGS or as a 12% or better improvement on the Hanover Functional Ability Questionnaire, taken at the 6 month follow-up assessment	-The unexpected similar findings of effectiveness in the true and sham acupuncture groups raises questions about the underlying mechanism of acupuncture and whether the emphasis on learning the traditional Chinese acupuncture groups may be superfluous	High Quality
Related Evidence Statement: <i>There is good evidence that both acupuncture and sham acupuncture are superior to usual care without acupuncture for moderate short-term and mild long-term alleviation of low back pain, neck pain, and the pain of joint osteoarthritis</i>						
Hay, et al. 2015	Physical Treatments vs a pain management program	Randomized Clinical Trial	N=402. Mean age 40.6. Patients with Low Back Pain in general practices in the UK.	Self-completed Roland Morris Disability Questionnaire (RMDQ)	The RMDQ change scores did not differ between groups at both 3 and 12 months of follow-up.	Adequate
Related Evidence Statement: <i>There is some evidence that a 2 day course focusing on the biopsychosocial model with an emphasis on the goals of returning to usual activities and fitness is as effective in reducing disability as six sessions of manual therapy sessions provided by physiotherapists and more limited patient education</i>						
Hoffman, et al. 2007	Psychological Interventions	Meta-analysis of controlled trials	Adults with non-malignant chronic low back pain lasting at least 3 months. Databases included MEDLINE, PsychINFO, EMBASE, CENTRAL, CINAHL through October 2004	Effect size defined as difference between mean psychological group outcome and control group outcome. Pain intensity was 1 outcome.	Psychological interventions appear to be superior to wait-list controls for pain intensity and health-related quality of life; and for work-related disability. -There is less superiority of psychological over other active interventions	Adequate (additional reference reviewed); (**additional statistical pooling done)

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<p>Related Evidence Statement: There is good evidence that biofeedback or relaxation therapy is equal in effect to cognitive behavioral therapy for chronic low back pain;</p> <p>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</p>						
Jensen, et al. 2012	Counseling	Randomized clinical trial	N=224. Adults in rheumatological outpatient clinics in Denmark.	Primary outcomes were level of back pain on a scale of 0-10, function by the Roland Morris questionnaire, physical function and body pain subscales of the SF-36, and sick leave as assessed by self-report and by the Danish National Register on Public Transfer Payments (DREAM), which captures sick leave periods of more than 2 consecutive weeks	The group with two counseling sessions had greater improvement in the SF-36 body pain, the SF-36 physical function, and maximum oxygen consumption than the control group, and had fewer sick leave days as well One limitation is lack of blinding of assessor and patient, but the randomization was successful	Inadequate -vague description of intervention; clinically unimpressive overall effects of counseling.
Kay, 2012. <i>Cochrane Collaboration</i>	Cervical exercises	Meta-analysis of randomized clinical trials	Adults with acute, subacute, and chronic neck pain. - Several databases were searched from their start through February 2012: MEDLINE, EMBASE, Manual Alternative and Natural Therapy (MANTIS), CINAHL, the Cochrane Central Register, the Cochrane Back Review	pain, function, patient satisfaction, and global perceived effect/quality of life; adverse effects were extracted when available	-Neck stretching and strengthening exercises are supported with moderate evidence for chronic neck pain relief, improving function and satisfaction with care in the long term	Adequate

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			Register, and the Index to Chiropractic Literature			
Related Evidence Statement: some evidence that an exercise program which includes resistance training of the cervical and scapulothoracic muscles, combined with stretching of the same muscles, is likely to be beneficial for mechanical neck pain						
Khot et al. 2005	Intradiscal steroid therapy	Randomized clinical trial	N=120. Mean age-44.	Oswestry scores. Visual Analog Scale	There is no clinical benefit to intradiscal steroid injection.	Adequate
Related Evidence Statement: There is some evidence that intradiscal steroid injection is unlikely to relieve pain or provide functional benefit in patients with non-radicular back pain therefore, they are not recommended						
Kuijper, et al. 2009	Cervical collar	Randomized clinical trial	N=205. Mean age-patients treated for cervical radiculopathy in Netherlands	Neck pain and arm pain on 100 point scale; neck disability index (NDI).	The semi-hard collar group had a statistically significant and clinically meaningful reduction in arm and neck, pain compared to the wait-and-see group Neck disability similarly improved more in the collar than in the wait-and-see group	Adequate
Related Evidence Statement: There is some evidence that semi-hard collars worn during the day for 3 weeks and then weaned over three weeks may hasten resolution of recent onset cervical radiculopathy						
Lamb et al, 2010	Cognitive-Behavioral Treatment	Group Randomized Clinical Trial	N=701. Mean age-54. Patients treated for low back pain	Roland-Morris; Von Korff Scale.	The CBT program was effective in managing subacute and chronic back pain in primary care, at a cost less than half of all competing interventions (manipulation, acupuncture, exercise, and postural approaches)	High Quality
Related Evidence Statement: 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						
Lambeek, et al. 2010	Integrated Care	Randomized Clinical Trial	N=134. Mean age-46. Patients with chronic low back pain in Amsterdam and Toronto	Return to work; Sick Leave	Integrated care directed at the patients' workplace as well as at the low back pain had a beneficial effect on disability	Adequate
Related Evidence Statement: There is some evidence that an integrated care program including 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 reduction of pain						
Langevin et al.	Botulinum Toxin	Meta-analysis of	Adults with nonradicular neck pain and	Patient-reported pain relief, function, and	Current evidence suggests that there is not a clinically or statistically significant	Adequate (**additional

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2011		randomized clinical trials	cervicogenic headache (excluded some types of disorders. Electronic databases included Cochrane Central Register, MEDLINE, CINAHL, EMBASE, Index to Chiropractic Literature, LILACS (Latin-American and Caribbean literature), and AMED (Allied and Complementary Medicine)	disability; observer-based physical function based on standardized testing and scoring procedures; patient satisfaction or quality of life.	benefit of BoNT-A in the treatment of chronic neck pain in the short term	<i>statistical pooling completed</i>
Related Evidence Statement: <i>Botulinum Injections are no longer generally recommended for cervicogenic or other headaches based on good evidence of lack of effect</i>						
Linde, et al. 2011	Onabotulinum toxin A	Crossover randomized clinical trial	N=28. Mean age 46. Adults with cervicogenic headache in a neurology clinic in Norway.	Change in mean weekly frequency of moderate to severe headache.	The use of botulinum toxin for cervicogenic headache is not supported by the study results	Adequate
Related Evidence Statement: <i>Botulinum Injections are no longer generally recommended for cervicogenic or other headaches based on good evidence of lack of effect</i>						
Lord et al. 1996	Radiofrequency neurotomy	Randomized Controlled Trial	N=24. Mean age 44. Patients with over 3 months of neck pain following motor vehicle accident in Australia	VAS	RF neurotomy more effective than placebo in relieving facet joint pain Results apply only to stringently selected patients (relief with diagnostic blocks with both short and long-acting anesthetic and not saline) and when technique is exacting	Adequate
Related Evidence Statement: <i>There is some evidence that radiofrequency neurotomy relieves pain and restores function in patients whose neck pain arises from the facet joint but benefits beyond one year are not yet established</i>						
Linton, et al. 2005	Cognitive-Behavioral and Physical Therapy	Randomized Clinical Trial	N=185. Primary care facilities in Sweden	Sick leave from work. Health Care Utilization	The addition of cognitive-behavioral treatment with or without physical therapy to the standard minimal treatment for patients with nonspecific back or neck pain decreases the risk for future disability by more than 5 fold	Adequate

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Related Evidence Statement: <i>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</i>						
Manchikanti, et al. 2013	Cervical, interlaminar epidural injections	Randomized Clinical Trial	N=120. Mean age 46. Patients treated for chronic cervical pain in Kentucky	50% improvement in both pain and function (Numerical Rating Scale and Neck Disability Index, respectively)	Fluoroscopically guided cervical interlaminar injections of local anesthetic with or without steroid effectively treat chronic neck pain due to disc herniation and radiculitis	Inadequate (issues related to placebo groups). Adequate on another issue
Miller, et al. 2010	Manual therapy and exercise	Systematic Review of Randomized Clinical Trials	Adults with acute to chronic neck pain. --- Databases were searched through July 2009 and included CENTRAL, MEDLINE, EMBASE, Manual Alternative and Natural Therapy, CINAHL, and the Index to Chiropractic Literature	Jadad criteria; Cochrane Back Review Group Criteria. Adapted Cochrane Risk of Bias	Manipulation or mobilization and exercise produce a greater long-term improvement in pain and global perceived effect when compared to no treatment for chronic neck pain.	Adequate
Two Related Evidence Statements:						
<ul style="list-style-type: none"> • <i>There is good evidence that adding exercise in combination with other interventions such as: 1) manipulation alone, or 2) manipulation and mobilization, or 3) mobilization, muscle energy, and stretching, is more effective than manipulation alone, mobilization alone, exercise alone, and other minimal intervention or education alone in reducing neck pain and disability</i> • <i>There is some evidence that mobilization, manipulation, and exercise does not provide greater long-term pain relief when compared to exercise alone.</i> 						
Ng, et al. 2005	Corticosteroids	Randomized	N=81. Mean age 50. Patients treated for chronic radicular pain in Leicester, UK	Oswestry, VAS, change in walking distance, patient satisfaction	Corticosteroid added no benefit to periradicular injection with bupivacaine for treatment of lumbar radicular pain.	Inadequate (difficulty establishing clear units of benefit). Adequate on another issue.
Related Evidence Statement, <i>There is good evidence that the addition of steroids to a transforaminal bupivacaine injection has a small effect on patient reported pain and disability</i>						
Oesch, et al. 2010	Exercise	Meta-analysis of	Workers with a primary diagnosis of non-specific	Work disability defined as sick leave days,	The odds ratio of 0.66 for RTW in the long term means that the odds of	Adequate

Author/Year	Intervention	Design	Population/Sample/Setting	Main Outcome Measure(s)	Author(s) Conclusion(s)/Discussion	Division Staff Assessment
		randomized clinical trials	low back pain. --- Databases included MEDLINE, PEDro, Cochrane Library, PsycINFO, through 2008	physician's judgment of work capability, or numbers of workers returning to full time work (RTW). Databases included MEDLINE, PEDro, Cochrane Library, PsycINFO, through 2008	improvement in work disability are 34% lower if only usual care, rather than exercise, is given	
Related Evidence Statement: <i>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</i>						
Persson, et al. 1997	Surgery, physiotherapy, or radicular collar	Randomized Controlled Trial	N=110. Mean age 48. Patients at outpatient neurosurgical clinic in Sweden	VAS, Mood adjective checklist, sickness impact profile.	Surgery, PT, and collar yield similar 1 year outcomes in cervicobrachial pain with evidence of DJD on x-ray	Inadequate. Issues with intention to treat and power to detect affect sizes.
Shuhendler, et. al. 2009	Botulinum Toxin	Meta-analysis of randomized clinical trials	Patients with episodic migraine headaches	Mean change in headache frequency.	The placebo effect in studies of BTX is very large, and BTX was not better than placebo at any dose or any duration in reducing frequency of headaches in patients with episodic migraine	High Quality (additional references reviewed)
Related Evidence Statement: <i>There is good evidence that botulinum toxin is not more effective than placebo for reducing the frequency of episodic migraines</i>						
Staal, et al. 2008	Injection therapy	Systematic Review of Randomized Trials.	Patients aged 18-79. - Databases were MEDLINE, EMBASE, and Cochrane CENTRAL through March 2007, with citation tracking of studies found by the search strategy	based on the Cochrane Back Review Group,	There is no strong evidence to support the use of any injection therapy (epidural, facet joint, local trigger point) for subacute low back pain without radicular pain	High Quality
Related Evidence Statement: <i>A high quality meta-analysis provides additional good evidence against the use of lumbar facet or epidural injections for relief of non-radicular low back pain</i>						
Storheim et al. 2003	Group training versus cognitive intervention	Randomized clinical trial	N=93. Mean age. General practitioner's office in 2 counties in	Pain (two VAS scales), disability (RMDQ), and sick-listing	The cognitive group improved in disability, the exercise group improved in pain, but none of the interventions decreased sick	Adequate

Author/Year	Intervention	Design	Population/Sample/Setting	Main Outcome Measure(s)	Author(s) Conclusion(s)/Discussion	Division Staff Assessment
			Norway		leave time.	
Related Evidence Statement <i>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</i>						
Trelle et. al. 2011	NSAIDs	Meta-analysis of randomized clinical trials	Patients treated with NSAIDs. -Databases included MEDLINE, EMBASE, and CENTRAL through December 2008, and updated in July 2009	primary outcome was fatal or nonfatal MI	Naproxen seemed the least harmful of the NSAIDs analyzed in the meta-analysis	High Quality
Related Evidence Statement: <i>There is good evidence that naproxen has the least risk for cardiovascular events when compared to other NSAIDs</i>						
Van Middlekoop, et al. 2013	Conservative care vs. surgery	Systematic Review of Randomized Controlled Trials	Adults with neck pain with or without radiculopathy. - Databases included MEDLINE, EMBASE, CINAHL, the Cochrane Central Register, and PEDro up to June 2011	Overall strength of evidence was summarized with GRADE criteria	There is low quality evidence that plasma disc decompression is more effective than conservative care for pain and function in cervical radiculopathy	Adequate on two issues
Related Statement: <i>The only trial was limited to a population not likely to apply to the workers' compensation population</i>						
Walker, et. al. 2008	Manual Physical Therapy	Randomized Clinical Trial	N=94. 3 physical therapy clinics	VAS; Neck Disability (NDI); Global Rating Change.	-Manual physical therapy and exercise was significantly more effective in reducing neck pain and disability than a minimal intervention, and increasing patient-perceived improvements during short- and long-term follow-ups	Adequate
Related Evidence Statement: <i>There is good evidence that adding exercise in combination with other interventions such as: 1) manipulation alone, or 2) manipulation and mobilization, or 3) mobilization, muscle energy, and stretching, is more effective than manipulation alone, mobilization alone, exercise alone, and other minimal intervention or education alone in reducing neck pain and disability</i>						
Young, et al. 2009	Manual therapy, exercise, traction,	Randomized clinical trial	N=81. Mean age-47.8. Treated for cervical radiculopathy in clinics of 4 states	The primary outcomes were the Numeric Pain Rating Scale (NPRS), the Patient-Specific	The addition of mechanical intermittent traction does not appear to improve outcomes for patients with cervical radiculopathy who are also receiving	Adequate

Author/ Year	Intervention	Design	Population/Sample/ Setting	Main Outcome Measure(s)	Author(s) Conclusion(s)/ Discussion	Division Staff Assessment
				Functional Scale (PSFS), and the Neck Disability Index (NDI)	postural education, manual therapy, and exercise at both 2 and 4 weeks of follow- up	
Related Evidence Statements: <i>There is some evidence that intermittent cervical traction does not add therapeutic benefit to a brief course of individualized manual therapy combined with exercise for patients with cervical radiculopathy</i>						
Operative Treatment						
Boselie, et al. 2013	Arthroplasty and fusion	Meta- analysis of randomize d clinical trials	Multiple Databases: MEDLINE, EMBASE, the Cochrane US FDA database on medical devices, and the System for Information on Grey Literature; resulting in 9 studies with a total of 2400 patients (1262 with artificial disks, 1138 with anterior cervical discectomy.	Quality based on Cochrane Back Review Guidelines; Clinical Relevance was classified according to pooled effect sizes	Clinically relevant difference between arthroplasty and fusion was not seen for primary outcomes. Overall quality of evidence was low to moderate.	High Quality
Related Evidence Statement: <i>There is good evidence that arthroplasty produces greater segmental range of motion after 1-2 years than fusion but its clinical significance is unknown</i>						
Eccleston , et al. 2009	Psychological therapies	Meta- analysis of randomize d clinical trials	Databases included MEDLINE, EMBASE, and Psychlit from inception through August 2008. Patients reporting chronic pain (with exclusions)	Quality rating scale designed for psychological interventions for pain was used to assess quality of treatment and risk of bias.	Evidence of effectiveness of CBT and BT is weak; most effect sizes are either statistically non-significant or small. -Behavioral change is complex, and most chronic pain patients have established patterns over a long period of time	Adequate
Related Evidence Statement: <i>good evidence that CBT may reduce pain and disability but the effect size was uncertain</i>						

Author/ Year	Intervention	Design	Population/Sample/Setting	Main Outcome Measure(s)	Author(s) Conclusion(s)/ Discussion	Division Staff Assessment
Jacobs, et al. 2011 <i>Cochrane Collaboration</i>	Single or double anterior interbody fusion techniques.	Meta-analysis of randomized clinical trials.	Patients scheduled for cervical spine surgery for chronic degenerative disc disease at one or two levels for pain lasting at least 12 weeks - Databases were MEDLINE, the Cochrane Library, EMBASE, and BIOSIS through May 2009	Risk of bias was assessed with the 12 criteria of the Cochrane Back Review Group. - Quality of evidence depended on how many of these six domains were met	No treatment was found to be superior for relief of pain in patients with cervical degenerative disc disease or disc herniation. The only choice which was supported by evidence (low quality) was between iliac crest autograft and a cage	High Quality
Related Evidence Statement: <i>There is some evidence that in cervical fusion for degenerative disease, iliac crest autograft provides greater fusion rates, but cages are a valid alternative as cages result in fewer complications from surgery</i>						
Kang et al. 2013	Artificial disc replacement (ADR) combined with anterior cervical discectomy and fusion (ACDF).	Randomized clinical trial	N=24. Mean age 54. Patients with 3-level disc disease surgically treated at a university hospital in China.	Neck Disability Index; neck and arm pain (VAS).	A hybrid operation combining artificial cervical discs at the top and bottom levels with fusion at the middle level generates a surgical efficacy similar to that of 3 level fusion. -Long term follow-up is necessary to evaluate the safety and efficacy of the hybrid technique	Inadequate (too small to support evidence statements)
Kluber-Moffet et al. 2006	Physiotherapy	Randomized Clinical Trial	N=315. Mean age 45 with neck pain	The primary outcome measure was the Physical Activity-Avoidance subscale of the Tampa Scale of Kinesiophobia.	Both interventions resulted in modest, but clinically important improvements over time on the Roland Disability Questionnaire Scores and Northwick Park Neck Pain Scores.	Adequate
Related Evidence Statement: <i>There is some evidence that the McKenzie approach provides similar outcomes in improving pain, disability and ability to carry out "work activities" in comparison with cognitive behavioral therapy</i>						
McAfee et al. 2012	Cervical Arthroplasty or anterior cervical fusion	Meta-analysis of randomized clinical trials	Adults with single level degenerative cervical conditions with radiculopathy or myelopathy who met	Neck Disability Index (NDI), neurological status, survivorship (avoidance of further surgery), and a	There is a strong argument for single level disc arthroplasty being at least as safe and effective as the prior "gold standard" of fusion for chronic neck pain with radiculopathy/myelopathy due to single	High Quality-additional references reviewed

Author/Year	Intervention	Design	Population/Sample/Setting	Main Outcome Measure(s)	Author(s) Conclusion(s)/Discussion	Division Staff Assessment
			inclusion criteria. -Study data was taken from the FDA approval documents submitted by each manufacturer in each IDE trial	composite outcome of overall success	level degenerative disc disease	
Related Evidence Statement: <i>There is strong evidence that in patients with single level radiculopathy or myelopathy cervical artificial disc produces 2 year success rates at least equal to those of anterior cervical discectomy and fusion (ACDF) with allograft interbody fusion and an anterior plate</i>						
Zigler, et. al. 2013	Pro-Disc and Anterior Cervical Discectomy	Five-year follow-up of a randomized clinical trial	N=209. Mean age 43. Patients participating in and Food and Drug Administration Investigation Device Exemption. 13 centers in USA	NDI; SF-36; components of VAS.	Total disc replacement with the ProDisc-C is a safe and effective treatment for disabling single level cervical disc disease with radiculopathy	Adequate (other reference reviewed).
Related Evidence Statement: <i>There is some evidence that TDR requires fewer revision operations than ACDF after the first two years of treatment and that TDR slightly decreases neck pain at 5 years compared to ACDF. Half of the reoperations in the ACDF group were at adjacent levels</i>						

See Next Page

RISK FACTORS/CAUSATION/PREVALENCE

Author/Year	Exposure/Condition	Design	Population/Sample/Sizing	Main Outcome Measure(s)	Author(s) Conclusion(s)/Discussion	Division Staff Assessment
Cote, et al. 2009	Burden of determinants of neck pain in workers.	Systematic Review of observational studies	MEDLINE from 1980 through 2006 for articles on neck pain and associated disorders such as cervicogenic headache.,	Quality was assessed using methods as outlined in Carroll, 2008, which pulls together quality assessment tools for a variety of study designs.	Neck pain is endemic in workers in the industrialized world; Most neck pain in workers is nontraumatic and its etiology is multifactorial Therefore, it is unlikely that prevention strategies targeting a single risk factor will reduce the occurrence of neck pain in the workplace	High Quality
Related Evidence Statement: <i>There is strong evidence that neck pain in the workplace is multifactorial and that a combination of workplace and individual factors is necessary to cause neck pain; There is some evidence that repetitive or precision work, accompanied by prolonged neck flexion are likely risk factors for neck pain in the work place</i>						
Gross, et al. 2004 (Part 1)	Functional Capacity Evaluation (FCE) for patients with chronic low back pain	Observational prognostic study	N=114. Mean age 41. Patients undergoing FCE in Alberta Canada	Amount of time on temporary total disability (TTD); relationship between failed FCE tasks and TTD.	It is sometimes recommended that RTW be recommended only when a claimant passes all of the tasks on the FCE. -This recommendation would prevent many claimants from returning to work; only 4% of the claimants achieved the goal of passing all FCE tasks, but nearly all of them closed their claims and terminated TTD benefits during the year following their FCE	Adequate
Related Evidence Statement: <i>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</i>						
Gross, et al. (Part 2)	Functional Capacity Evaluation (FCE) for patients with chronic low back pain	Observational prognostic study	N=114. Mean age 41. Patients undergoing FCE in Alberta Canada	Amount of time on temporary total disability (TTD); relationship between failed FCE tasks and TTD.	Contrary to expectations, better performance on FCE tasks was associated with higher risk of recurrence	Adequate
Related Evidence Statement: <i>There is some evidence that an FCE fails to predict which injured workers with chronic low back pain will have sustained return to work</i>						
Kalanithi	Morbid Obesity	Cross	N=84,607 hospital	Post-operative	Morbid obesity is associated with	Adequate

Author/Year	Exposure/Condition	Design	Population/Sample/Setting	Main Outcome Measure(s)	Author(s) Conclusion(s)/Discussion	Division Staff Assessment
et al. 2012		sectional study of the effect of morbid obesity on costs and complications of spine fusion	admissions for spinal fusion. California State inpatient databases (CA-SID).	complications as identified by ICD-9CM.	increased frequency of postoperative complications in patients undergoing anterior cervical and posterior lumbar spinal fusion, and is more predictive of complications than age and medical comorbidities	(Additional reference reviewed)
Related Evidenced Statement: There is some evidence that morbid obesity increases hospital length of stay, mortality and postoperative complications of spinal fusion surgery and results in concomitant increases in cost						
Prado-Leon, et al. 2005	Occupational Lifting Tasks	Case-control	N=231. Between ages of 18 and 55. Guadalajara	Lumbar spondyloarthrosis as confirmed by clinical examination, imaging, and diagnostic review	Lifting has an important effect in the development of lumbosacral spondyloarthrosis	Adequate
2 Related Evidenced Statement:						
<ol style="list-style-type: none"> 1. There is good evidence that trunk flexion, rotation and lifting in the work place cumulatively is associated with low back pain 2. There is some evidence that exposures of seven hours per week or greater, over more than 9.5 years is associated with low back pain in an apparent dose response relationship 						