

Cervical Spine Injury Medical Treatment Guidelines

**Proposed by the
State of New York
Department of Insurance
to the
Workers' Compensation Board**



Cervical Spine Injury

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INTRODUCTION TO CERVICAL SPINE INJURY

Standard procedures that should be utilized when initially diagnosing a work-related cervical spine complaint are listed below.

A. INITIAL DIAGNOSTIC PROCEDURES

1. **HISTORY TAKING AND PHYSICAL EXAMINATION** establish the foundation/basis for and dictate subsequent stages of diagnostic and therapeutic procedures. When findings of clinical evaluations and those of other diagnostic procedures are not complementing each other, the objective clinical findings should have preference. The medical records should reasonably document the following:
 - a. **History of Present Injury:** A detailed history, taken in temporal proximity to the time of injury, should primarily guide evaluation and treatment. The history should include:
 - i. **Mechanism of Injury:** This includes details of symptom onset and progression. The mechanism of injury should include a detailed description of the incident and the position of the body before, during, and at the end of the incident. Inclusion of work body postures, frequency during the workday and lifting/push/pull requirements should be included in the absence of a known specific incident.
 - ii. **Location of pain, nature of symptoms, and alleviating/exacerbating factors (e.g. sleep positions).** Of particular importance is whether raising the arm over the head alleviates radicular-type symptoms. The history should include both the primary and secondary complaints (e.g., primary neck pain, secondary arm pain, headaches, and shoulder girdle complaints). The use of a patient completed pain drawing, Visual Analog Scale (VAS) is highly recommended, especially during the first two weeks following injury to assure that all work related symptoms are being addressed.
 - iii. **Presence and distribution of upper and/or lower extremity numbness, paresthesias, or weakness, especially if precipitated by coughing or sneezing.**
 - iv. **Prior occupational and non-occupational injuries to the same area including specific prior treatment, history of specific**

prior motor vehicle accidents, chronic or recurrent symptoms, and any functional limitations.

- v. Ability to perform job duties and activities of daily living.

b. Past History:

- i. Comprehensive past medical history.
- ii. Review of systems includes symptoms of rheumatologic, neurologic, endocrine, neoplastic, infectious, and other systemic diseases.
- iii. Smoking history.
- iv. Vocational and recreational pursuits.
- v. History of depression, anxiety, or other psychiatric illness.

c. Physical Examination: Should include accepted tests and exam techniques applicable to the area being examined, including:

- i. Visual inspection, including posture.
- ii. Cervical range of motion, quality of motion, and presence of muscle spasm. Motion evaluation of specific joints may be indicated. Range of motion should not be checked in acute trauma cases until fracture and instability have been ruled out on clinical examination, with or without radiographic evaluation.
- iii. Examination of thoracic spine.
- iv. Palpation of spinous processes, facets, and muscles noting myofascial tightness, tenderness, and trigger points.
- v. Motor and sensory examination of the upper muscle groups with specific nerve root focus, as well as sensation to light touch, pin prick, temperature, position and vibration. More than 2 cm difference in the circumferential measurements of the two upper extremities may indicate chronic muscle wasting.
- vi. Deep tendon reflexes. Asymmetry may indicate pathology. Inverted reflexes (e.g. arm flexion or triceps tap) may indicate nerve root or spinal cord pathology at the tested

level. Pathologic reflexes include wrist, clonus, grasp reflex, and Hoffman's sign.

- d. **Relationship to Work:** This includes a statement of the probability that the illness or injury is work-related. If further information is necessary to determine work relatedness, the physician should clearly state what additional diagnostic studies or job information is required.
- e. **Spinal Cord Evaluation:** In cases where the mechanism of injury, history, or clinical presentation suggests a possible severe injury, additional evaluation is indicated. A full neurological examination for possible spinal cord injury may include:
- i. Sharp and light touch, deep pressure, temperature, and proprioceptive sensory function;
 - ii. Strength testing;
 - iii. Anal sphincter tone and/or perianal sensation;
 - iv. Presence of pathological reflexes of the upper and lower extremities; or
 - v. Evidence of an Incomplete Spinal Cord Injury Syndrome:
 - Anterior Cord Syndrome is characterized by the loss of motor function and perception of pain and temperature below the level of the lesion with preservation of touch, vibration, and proprioception. This is typically seen after a significant compressive or flexion injury. Emergent CT or MRI is necessary to look for a possible reversible compressive lesion requiring immediate surgical intervention. The prognosis for recovery is the worst of the incomplete syndromes.
 - Brown-Sequard Syndrome is characterized by ipsilateral motor weakness and proprioceptive disturbance with contralateral alteration in pain and temperature perception below the level of the lesion. This is usually seen in cases of penetrating trauma or lateral mass fracture. Surgery is not specifically required, although debridement of the open wound may be.

- Central Cord Syndrome is characterized by sensory and motor disturbance of all limbs, often upper extremity more than lower, and loss of bowel and bladder function with preservation of perianal sensation. This is typically seen in elderly patients with a rigid spine following hyperextension injuries. Surgery is not usually required.
 - Posterior Cord Syndrome, a rare condition, is characterized by loss of sensation below the level of the injury, but intact motor function.
- vi. Spinal cord lesions should be classified according to the American Spine Injury Association (ASIA) impairment scale.

ASIA IMPAIRMENT SCALE
<ul style="list-style-type: none"> ❑ A=Complete: No motor or sensory function is preserved in the sacral segments S4-S5 ❑ B=Incomplete: Sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5 ❑ C=Incomplete: Motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3 ❑ D=Incomplete: Motor function is preserved below the neurological level, and at least half of key muscles below the neurological level have a grade of 3 or more ❑ E= Normal: motor and sensory function are normal

A worksheet which details dermatomes and muscle testing required is available from ASIA.

- f. **Soft Tissue Injury Evaluation:** Soft tissue injuries are traumatic injuries to the muscles, ligaments, tendons, and/or connective tissue. The most common mechanism is sudden hyperextension and/or hyperflexion of the neck. Acceleration/deceleration on the lateral plane may also result in one of these syndromes. A true

isolated cervical strain is not associated with focal neurological symptoms. Soft tissue injuries may include cervical strain, myofascial syndromes, and somatic dysfunction. The Quebec Classification is used to categorize soft tissue and more severe cervical injuries:

- i. Grade I: Neck complaints of pain, stiffness, or tenderness only, without physical signs. Lesion not serious enough to cause muscle spasm. Includes whiplash injury, minor cervical sprains, or strains.
- ii. Grade II: Neck complaints with musculoskeletal signs, such as limited range-of-motion. Includes muscle spasm related to soft tissue injury, whiplash, cervical sprain, and cervicalgia with headaches, sprained cervical facet joints and ligaments.
- iii. Grade III: Neck complaints, such as limited range-of-motion, combined with neurologic signs. Includes whiplash, cervicobrachialgia, herniated disc, cervicalgia with headaches.
- iv. Grade IV: Neck complaints with fracture or dislocation.

2. **IMAGING** of the cervical spine may be obtained as deemed clinically appropriate. Basic views are the anteroposterior (AP), lateral, right, and left obliques, swimmer's, and odontoid. CT scans may be necessary to visualize C7 and odontoid in some patients. Lateral flexion and extension views are done to evaluate instability but may have a limited role in the acute setting. MRI or CT is indicated when spinal cord injury is suspected. The mechanism of injury and specific indications for the imaging should be listed on the request form to aid the radiologist and x-ray technician. Alert, non-intoxicated patients, who have isolated cervical complaints without palpable midline cervical tenderness, neurologic findings, or other acute or distracting injuries elsewhere in the body, may not require imaging. The following suggested indications are:

- a. History of significant trauma, especially high impact motor vehicle accident, rollover, ejection, bicycle, or recreational vehicle collision or fall from height greater than one meter.
- b. Age over 65 years.
- c. Suspicion of fracture, dislocation, instability, or neurologic deficit - Quebec Classification Grade III and IV.

- d. Unexplained or persistent cervical pain for at least 6 weeks or pain that is worse with rest.
 - e. Localized pain, fever, constitutional symptoms, suspected tumor, history of cancer, or suspected systemic illness such as a rheumatic/rheumatoid disorder or endocrinopathy.
3. **LABORATORY TESTING:** Laboratory tests are rarely indicated at the time of initial evaluation, unless there is suspicion of systemic illness, infection, neoplasia, or underlying rheumatologic disorder, connective tissue disorder, or based on history and/or physical examination. Laboratory tests can provide useful diagnostic information. Tests include, but are not limited to:
- a. Complete blood count (CBC) with differential can detect infection, blood dyscrasias, and medication side effects.
 - b. Erythrocyte sedimentation rate (ESR), rheumatoid factor (RF), anti-nuclear antigen (ANA), human leukocyte antigen (HLA), and C-reactive protein (CRP), can be used to detect evidence of a rheumatologic, infection, or connective tissue disorder.
 - c. Serum calcium, phosphorous, uric acid, alkaline phosphatase, and acid phosphatase can detect metabolic bone disease.
 - d. Liver and kidney function may be performed for prolonged anti-inflammatory use or other medications requiring monitoring.

B. FOLLOW-UP DIAGNOSTIC IMAGING AND TESTING PROCEDURES

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

All imaging procedures have a degree of specificity and sensitivity for various diagnoses. No isolated imaging test can assure a correct diagnosis. Clinical information obtained by history taking and physical examination should form the basis for selecting an imaging procedure and interpreting its results.

Magnetic resonance imaging (MRI), myelography, or computed axial tomography (CT) scanning following myelography may provide useful information for many spinal disorders. When a diagnostic procedure, in conjunction with clinical information, provides sufficient information to establish an accurate diagnosis, the second diagnostic procedure will become a redundant procedure. At the

same time, a subsequent diagnostic procedure (that may be a repeat of the same procedure, when the rehabilitation physician, radiologist or surgeon documents that the study was of inadequate quality to make a diagnosis) can be a complementary diagnostic procedure if the first or preceding procedures, in conjunction with clinical information, cannot provide an accurate diagnosis. Usually, preference of a procedure over others depends upon availability, a patient's tolerance, and/or the treating practitioner's familiarity with the procedure.

1. **IMAGING STUDIES:** In the absence of myelopathy or progressive neurological changes, imaging usually is not appropriate until conservative therapy has been tried and failed. Six to eight weeks of treatment are usually an adequate period of time before an imaging procedure is in order, but the clinician should use judgment in this regard. When the findings of the diagnostic imaging and testing procedures are not consistent with the clinical examination, clinical findings should have preference. There is good evidence that in the over-40 asymptomatic population, the prevalence of disc degeneration is greater than 50%. Disc degeneration, seen as loss of signal intensity on MRI, may be due to age-related changes causing biochemical changes and structural changes separate and distinct from traumatic injury and may not have pathological significance. Disc bulging and posterior disc protrusion, while not rare, is more commonly symptomatic in the cervical spine than in the lumbar spine due to the smaller cervical spinal canal. Mild reduction in the cross-sectional area of the spinal cord may be seen without myelopathy in patients older than 40, therefore, clinical correlation is required.

The studies below are listed in frequency of use, not importance.

- a. **Magnetic Resonance Imaging (MRI):** MRI is useful in suspected nerve root compression, in myelopathy to evaluate the spinal cord and/or differentiate or rule out masses, infections such as epidural abscesses or disc space infection, bone marrow involvement by metastatic disease, and/or suspected disc herniation or cord contusion following severe neck injury. MRI should be performed immediately if there is a question of infection or metastatic disease with cord compression. MRI is contraindicated in patients with certain implanted devices.

In general, the high field, conventional, MRI provides better resolution. A lower field scan with lower magnetic intensity may be indicated when a patient cannot fit into a high field scanner or is too claustrophobic despite sedation.

Inadequate resolution on the first scan may require a second MRI using a different technique. A subsequent diagnostic MRI may be a repeat of the same procedure when the rehabilitation physician, radiologist or surgeon documents that the study was of inadequate quality to make a diagnosis. All questions in this regard should be discussed with the MRI center and/or radiologist.

Ferrous material/metallic objects present in the tissues is a contraindication for the performance of an MRI.

Specialized MRI Scans

i. MRI with 3-dimensional reconstruction:

On rare occasions, MRI with 3-dimensional reconstruction views may be used as a pre-surgical diagnostic procedure to obtain accurate information of characteristics, location, and spatial relationships among soft tissue and bony structures.

ii. Dynamic-kinetic MRI of the spine:

Dynamic-kinetic MRI of the spine uses an MRI unit configured with a top-front open design which enables upright, weight-bearing patient positioning in a variety of postures not obtainable with the recumbent images derived from conventional, closed unit MRI systems. Imaging can be obtained in flexion, extension, and rotation of the spine, as well as in erect positioning. There is a theoretical advantage to imaging sequences obtained under more physiologic conditions than in the supine position. There is currently ongoing research to establish whether the theoretical advantages of positional and kinetic MRI result in improved sensitivity and specificity in detecting spine pathology. Currently it remains investigational, and is not recommended until the correlation with clinical syndromes is firmly established.

- b. **Computed Axial Tomography (CT):** provides excellent visualization of bone and is used to further evaluate bony masses and suspected fractures not clearly identified on radiographic evaluation. It may sometimes be done as a complement to MRI scanning to better delineate bony osteophyte formation in the neural foramen. CT is usually utilized for suspected cervical spine fracture in a patient with negative plain films, or to further delineate a cervical fracture. CT scanning is also quite useful for congenital

anomalies at the skull base and at the C1-2 levels. Plain CT scanning is poor for the C6-7 or C7-T1 levels because of shoulder artifact. Instrument-scatter reduction software provides better resolution when metallic artifact is of concern. When ferrous/ metallic materials are present in the tissues, CT should be ordered rather than an MRI.

- c. **Myelography:** is the injection of radiopaque material into the spinal subarachnoid space, with x-rays then taken to define anatomy. It may be used as a pre-surgical diagnostic procedure to obtain accurate information of characteristics, location, and spatial relationships among soft tissue and bony structures. Myelography is an invasive procedure with complications including nausea, vomiting, headache, convulsion, arachnoiditis, CSF leakage, allergic reactions, bleeding, and infection. Therefore, myelography should only be considered when CT and MRI are unavailable, for morbidly obese patients or those who have undergone multiple operations, and when other tests prove non-diagnostic in the surgical candidate. The use of small needles and a less toxic, water-soluble, nonionic contrast is recommended.
- d. **CT Myelogram:** provides more detailed information about relationships between neural elements and surrounding anatomy and is appropriate in patients with multiple prior operations or tumorous conditions only for presurgical testing.
- e. **Lineal Tomography:** is infrequently used, yet may be helpful in the evaluation of bone surfaces, bony fusion, or pseudarthrosis.
- f. **Bone Scan (Radioisotope Bone Scanning):** Bone scanning is more sensitive but less specific than MRI. ^{99m}Tc diphosphonate uptake reflects osteoblastic activity and may be useful in diagnosing metastatic/primary bone tumors, stress fractures, osteomyelitis, and inflammatory lesions, but cannot distinguish between these entities. In the cervical spine, the usual indication is to evaluate for neoplastic conditions. Chiefly indicated with persistent symptoms with otherwise normal diagnostic tests or to differentiate old vs. new lesions. Other indications include occult fracture or infection.
- g. **Other Radioisotope Scanning:** Indium and gallium scans are usually used to help diagnose lesions seen on other diagnostic imaging studies. ⁶⁷Ga citrate scans are used to localize tumor, infection, and abscesses.

- h. **Dynamic [Digital] Fluoroscopy:** Dynamic [Digital] Fluoroscopy of the cervical spine measures the motion of intervertebral segments using a videofluoroscopy unit to capture images as the subject performs cervical flexion and extension, storing the anatomic motion of the spine in a computer. Dynamic Fluoroscopy may be used in designated trauma centers to evaluate the cervical spine. Its superiority over MRI has not been established. If performed, full visualization of the cervical spine (C1 - T1).

2. **OTHER TESTS:** The following diagnostic procedures are listed in alphabetical order, not by importance.

a **Electrodiagnostic Testing:**

- i. **Electrodiagnostic Studies** when performed and interpreted by a trained physician/electrophysiologist, may be useful for patients with suspected neural involvement whose symptoms are persistent or unresponsive to initial conservative treatments. They are used to differentiate peripheral neural deficits from radicular and spinal cord neural deficits and to rule out concomitant myopathy. However, F-Wave Latencies are not diagnostic for radiculopathy.

In general, electrodiagnostic studies are complementary to imaging procedures such as CT, MRI, and/or myelography. Whereas Xray, CT and MRI reflect structural changes, electrodiagnostic studies reflect neurologic functional status.

If significant radiating arm symptoms are present for greater than 4-6 weeks after the onset of injury and no obvious level of nerve root dysfunction is evident on examination, electrodiagnostic studies may be indicated.

Electrodiagnostic studies may also be useful to determine the extent of injury in patients with an established level of injury.

- ii. **Portable Automated Electrodiagnostic Device (also known as Surface EMG).** Surface EMG is not appropriate for diagnostic evaluation of neck pain or neck injuries under any circumstances.
- iii. **Somatosensory Evoked Potential (SSEP)** is useful for the evaluation of myelopathy. It is not recommended to identify radiculopathy.

- iv. Current Perception Threshold Evaluation (CPT) may be useful as a screening tool, but its diagnostic efficacy in the evaluation of cervical spine pain has not been determined. Therefore, CPT is not recommended as a diagnostic tool.
- b. **Injections - Diagnostic:** (including median branch blocks, atlanto-axial/atlanto-occipital/transforaminal injections and zygapophyseal blocks): Not Recommended.
- c. **Provocation Discography:** Not Recommended.
- d. **Thermography:** Not Recommended.

C. THERAPEUTIC PROCEDURES, NON-OPERATIVE

Before initiation of any therapeutic procedure, the authorized treating provider, employer, and insurer must consider these important issues in the care of the patient.

First, patients undergoing therapeutic procedure(s) should be released or returned to modified or restricted duty during their rehabilitation at the earliest appropriate time.

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

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

Lastly, for those patients who fail to make expected progress 6-12 weeks after an injury and whose subjective symptoms do not correlate with objective signs and tests, reexamination in order to confirm the accuracy of the diagnosis should be made. Formal psychological or psychosocial evaluation may be considered.

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

The following procedures are listed in alphabetical order:

1. **ACUPUNCTURE** is a procedure used for the relief of pain and inflammation, and there is some scientific evidence to support its use. The exact mode of action is only partially understood. Western medicine studies suggest that acupuncture stimulates the nervous system at the level of the brain, promotes deep relaxation, and affects the release of neurotransmitters. Acupuncture is commonly used as an alternative or in addition to traditional Western pharmaceuticals. While it is commonly used when pain medication is reduced or not tolerated, it may be used as an adjunct to physical rehabilitation and/or surgical intervention to hasten the return of functional activity. Moxibustion and other complementary integrative medicine techniques are often combined with acupuncture, but have no demonstrated efficacy. No additional reimbursement should be provided for acupuncture combined with moxibustion or other similar adjunctive procedures. Acupuncture must be performed by a professional who is authorized under the Workers' Compensation Laws and duly certified in New York State to provide acupuncture services.
 - a. **Acupuncture (With or Without Electrical Stimulation):** is the insertion and removal of filiform needles to stimulate acupoints (acupuncture points), with or without the use of electrical current (micro-amperage or milli-amperage) on the needles at the acupuncture site. Needles may be inserted, manipulated and retained for a period of time. Acupuncture can be used to reduce pain, reduce inflammation, increase blood flow, increase range of motion, decrease the side effect of medication-induced nausea, promote relaxation in an anxious patient, and reduce muscle spasm. Indications include joint pain, joint stiffness, soft tissue pain and inflammation, paresthesia, post-surgical pain relief, muscle spasm, and scar tissue pain.
 - Time to produce effect: 3 to 6 treatments.
 - Frequency: 1 to 3 times per week.
 - Optimum duration: 1 month.
 - Maximum duration: 10 treatments.
 - Total Time Frames for Acupuncture and Acupuncture with Electrical Stimulation: Time frames are not meant to be applied to each of the above sections separately. The time frames are to be applied to all acupuncture treatments regardless of the type or combination of therapies being provided.

Acupuncture treatments may extend longer if objective functional gains can be documented or when symptomatic benefits facilitate progression in the patient's treatment program. Treatment beyond 10 treatments must be documented with respect to need and ability to facilitate positive symptomatic or functional gains.

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

Treatment is individualized to the patient's work-related diagnosis and needs. Home practice of skills is required for mastery and may be facilitated by the use of home training tapes. The ultimate goal of biofeedback treatment is to normalize the physiology to the pre-injury status to the extent possible, and involves transfer of learned skills to the workplace and daily life. Candidates for biofeedback therapy or training must be motivated to learn and practice biofeedback and self-regulation techniques.

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

Biofeedback is not appropriate for individuals suffering from acute neck pain or acute injury. It may be appropriate for subacute or chronic neck pain when combined with a program including functional restoration.

- Time to Produce Effect: 3 to 4 sessions.
- Frequency: 1 to 2 times per week.
- Optimum Duration: 5 to 6 sessions.

- Maximum Duration: 10 to 12 sessions. Treatment beyond 12 sessions must be documented with respect to need, expectation, and ability to facilitate positive functional gains.

3. **INJECTIONS: THERAPEUTIC**

a. **Therapeutic Spinal Injections:**

Description: Therapeutic spinal injections may be used after initial conservative treatments, such as physical and occupational therapy, medication, manual therapy, exercise, acupuncture, have been undertaken. Therapeutic injections should be used only after imaging studies and diagnostic injections have established pathology. Injections are invasive procedures that can cause catastrophic complications; thus clinical indications and contraindications should be closely adhered to. The purpose of spinal injections is to facilitate active therapy by providing short-term relief through reduction of pain and inflammation. All patients should continue appropriate exercise with functionally directed rehabilitation. Active treatment, which patients should have had prior to injections, will frequently require a repeat of the sessions previously ordered. Injections, by themselves, are not likely to provide long-term relief. Rather, active rehabilitation with modified work achieves long-term relief by increasing active range of motion, strength, and stability. If the first injection does not provide a diagnostic response with temporary and sustained pain relief substantiated by accepted pain scales, (i.e., 80% pain reduction on Visual Analog Scale), and improvement in function, similar injections should not be repeated.

Special Considerations: For all injections (excluding trigger point and occipital nerve blocks) multi-planar fluoroscopy during procedures is required to document technique and needle placement. All injections should be performed by a physician experienced in the procedure. Permanent images are required to verify needle placement. The subspecialty disciplines of the physicians performing injections may be varied, including, but not limited to: anesthesiology, radiology, surgery, or physiatry. The practitioner should have completed fellowship training in pain medicine with interventional training, or its equivalent. They must also be knowledgeable in radiation safety.

Complications: General complications of spinal injections may include transient neurapraxia, local pain, nerve injury, infection,

headache, vasovagal effects. Epidural hematoma, permanent neurologic damage, dural perforation and CSF leakage, and/or spinal meningeal abscess may also occur. More serious complications are rare but can include spinal cord damage; quadriplegia; permanent ataxia, and death. Injections at a C2-C3 level frequently cause temporary neuritis with ataxia. With steroid injections, there may be a dose-dependent suppression of the hypothalamic-pituitary-adrenal axis lasting between one and three months.

Contraindications: Absolute contraindications to therapeutic injections include: (a) bacterial infection – systemic or localized to region of injection, (b) bleeding diatheses, (c) hematological conditions, and (d) possible pregnancy.

Relative contraindications to diagnostic injections may include: allergy to contrast, poorly controlled Diabetes Mellitus and hypertension. Drugs affecting coagulation require restriction from use. The following are suggested time period restrictions:

- Aspirin-withhold for seven days;
- NSAIDs-withhold for three days;
- Clopidogrel-withhold for 3 days;
- Other anti-platelet therapy and anti-coagulants should also be addressed individually by a knowledgeable specialist.

i. Cervical Epidural Steroid Injection (ESI):

- Description: Cervical ESIs are injections of corticosteroid into the epidural space. The purpose of ESI is to reduce pain and inflammation in the acute or subacute phases of injury, restoring range-of-motion, and thereby, facilitating progress in more active treatment programs.
- Needle placement: Multi-planar fluoroscopic imaging is required for all epidural steroid injections. Contrast epidurograms allow one to verify the flow of medication into the epidural space. Permanent images are required to verify needle placement.
- Indications: Cervical ESIs are useful in patients with symptoms of cervical radicular pain syndromes.

There is some evidence that epidural steroid injections are effective for patients with radicular pain.

There is some evidence to suggest that epidural injections are not effective for cervical axial pain or non radicular pain syndromes and they are not recommended for this indication.

- ◆ Time to Produce Effect: Local anesthetic, less than 30 minutes; corticosteroid, 48 to 72 hours for 80% of patients and 72 hours to 2 weeks for 20% of patients.
- ◆ Frequency: One or more divided levels can be injected in one session. Whether injections are repeated depends upon the patient's response to the previous injection. Subsequent injections may occur after 1 to 2 weeks if patient response has been favorable. Injections can be repeated after a hiatus of six months if the patient has demonstrated functional gain and pain returns or worsens. If the first injection does not provide a diagnostic response with temporary and sustained pain relief (at least 2 to 6 weeks) substantiated by accepted pain scales (i.e., 80% pain reduction as measured by tools such as VAS), and improvement in function, similar injections should not be repeated.
- ◆ Optimal Duration: Usually 1 to 3 injection(s), over a period of six months depending upon each patient's response and functional gain.
- ◆ Maximum Duration: Two sessions consisting of up to three injections each may be done in one year, as per the patient's response to pain and function. Patients should be reassessed after each injection for an 80% improvement in pain (as measured by accepted pain scales) and evidence of functional improvement.

ii. Zygapophyseal (Facet) Injection:

- Description: Intra-articular or pericapsular injection of local anesthetic and corticosteroid. There is conflicting evidence to support long-term therapeutic effect using facet injections. There is no justification for a combined facet and medial branch block.
- Indications: Patients with pain 1) suspected to be facet in origin based on exam findings and 2) affecting activity; OR patients who have refused a rhizotomy; OR patients who have facet findings with a thoracic component. In these patients, facet injections may be occasionally useful in facilitating a functionally-directed rehabilitation program and to aid in identifying pain generators. Patients with recurrent pain should be evaluated with more definitive diagnostic injections, such as medial nerve branch injections, to determine the need for a rhizotomy. Because facet injections are not likely to produce long-term benefit by themselves and are not the most accurate diagnostic tool, they should not be performed at more than two levels.

Facet injections may be repeated if they result in increased documented functional benefit for at least 4 to 6 weeks and at least an 80% initial improvement in pain scales as measured by accepted pain scales (such as VAS).

- ◆ Time to Produce Effect: Up to 30 minutes for local anesthetic; corticosteroid up to 72 hours.
- ◆ Frequency: 1 injection per level with a diagnostic response. If the first injection does not provide a diagnostic response of temporary and sustained pain relief substantiated by accepted pain scales, (i.e., 80% pain reduction substantiated by tools such as VAS), and improvement in function, similar injections should not be repeated. At least 4 to 6 weeks of functional benefit

should be obtained with each therapeutic injection.

- ◆ Optimum Duration: 2 to 3 injections for each applicable joint per year. Not to exceed two joint levels.
- ◆ Maximum Duration: 4 per level per year. Prior authorization must be obtained for injections beyond two levels.

- iii. Intradiscal Steroid Therapy: Intradiscal Steroid Therapy consists of injection of a steroid preparation into the intervertebral disc under fluoroscopic guidance at the time of discography. There is good evidence that it is not effective in the treatment of suspected discogenic low back pain. There is no support for its use in the cervical spine and its use is not recommended.

b. Radio Frequency (RF) Medial Branch Neurotomy/ Facet Rhizotomy:

- i. Description: A procedure designed to denervate the facet joint by ablating the corresponding sensory medial branches. Continuous percutaneous radio-frequency is the method generally used.

There is good evidence to support this procedure in the cervical spine but benefits beyond one year are not yet established. Radio-frequency medial branch neurotomy is the procedure of choice over alcohol, phenol, or cryoablation. Precise positioning of the probe under fluoroscopic guidance is required since the maximum effective diameter of the device is a 5 x 8 millimeter oval. Permanent images should be recorded to verify placement of the device.

- ii. Indications: Those patients with proven, significant, facetogenic pain. This procedure is not recommended for patients with multiple pain generators or involvement of more than 3 medial branch nerves.

Individuals should have met the following indications: pain of well-documented facet origin, unresponsive to active and/or passive therapy, manual therapy, and in which a psychosocial screening has been performed (e.g., pain

diagram, thorough psychosocial history, screening questionnaire). It is generally recommended that this procedure not be performed until three months of active therapy and manual therapy have been completed. All patients should continue appropriate exercise with functionally directed rehabilitation. Active treatment, which patients will have had prior to the procedure, will frequently require a repeat of the sessions previously ordered.

All patients should have a successful response to a diagnostic medial nerve branch block and a separate comparative block. To be a positive diagnostic block the patient should report a reduction of pain of 80% or greater from baseline for the length of time appropriate for the local anesthetic used. In almost all cases this will mean a reduction of pain to 1 or 2 on the VAS 10-point scale correlated with functional improvement. The patient should also identify activities of daily living (which may include measurements of range-of-motion) that are impeded by their pain and can be observed to document functional improvement in the clinical setting. Ideally, these activities should be assessed throughout the observation period for function. The observer should not be the physician who performed the procedure.

A separate comparative block should be performed on a different date to confirm the level of involvement. A comparative block uses anesthetics with varying lengths of activity.

- iii. Complications: Bleeding, infection, or neural injury. The clinician must be aware of the risk of developing a localized neuritis, and rarely, a deafferentation centralized pain syndrome as a complication of this and other neuro-ablative procedures.
- iv. Post-Procedure Therapy: Active therapy. Implementation of a gentle reconditioning program within the first post-procedure week is recommended, barring complications. Instruction and participation in a long-term home-based program of range of motion, cervical, scapular, and thoracic strengthening, postural or neuromuscular re-education, endurance, and stability exercises should be accomplished over a period of four to ten visits post-procedure.

- v. Requirements for repeat RF neurotomy (or additional level RF neurotomies): In some cases pain may recur. Successful rhizotomy usually provides from six to eighteen months of relief.

Before a repeat RF neurotomy is done, a confirmatory medial branch injection should be performed if the patient's pain pattern presents differently than in the initial evaluation. In occasional patients, additional levels of RF neurotomy may be necessary. The same indications and limitations apply.

c. Occipital Nerve Block:

- i. Description: Occipital nerve blocks are injections used both diagnostically and therapeutically in the treatment of occipital neuralgia. The greater occipital nerve is the target.
- ii. Indications: Diagnosis and treatment of occipital neuralgia/cephalgia. Peripheral block of the greater occipital nerve may be appropriate as initial treatment. It may be indicated in patients unresponsive to peripheral nerve block or those patients in need of additional diagnostic information.
- iii. Complications: Bleeding, infection, neural injury. Post procedural ataxia is common and usually lasts 30 minutes post procedure. Because the occipital artery runs with the occipital nerve, inadvertent intravascular injection is a risk of this procedure and may lead to systemic toxicity and/or seizures.
 - Time to Produce Effect: Approximately 30 minutes for local anesthetic; 48 to 72 hours for corticosteroid.
 - Optimal Duration: 1 to 3 sessions.
 - Maximum Duration: Continue up to 3 injections if progressive symptomatic and functional improvement can be documented.

d. Trigger Point Injections and Dry Needling Treatment:

- i. Description: Trigger point treatment can consist of dry needling or injection of local anesthetic with or without corticosteroid into highly localized, extremely sensitive bands of skeletal muscle fibers that produce local and referred pain

when activated. Medication is injected in a four-quadrant manner in the area of maximum tenderness. Injection efficacy can be enhanced if injections are immediately followed by myofascial therapeutic interventions, such as vapo-coolant spray and stretch, ischemic pressure massage (myotherapy), specific soft tissue mobilization and physical modalities. There is conflicting evidence regarding the benefit of trigger point injections. A truly blinded study comparing dry needle treatment of trigger points is not feasible. There is no evidence that injection of medications improves the results of trigger-point injections. Needling alone may account for some of the therapeutic response.

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

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

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

- iii. Complications: Potential but rare complications of trigger point injections include infection, pneumothorax, anaphylaxis, neurapraxia, and neuropathy. Severe pain on

injection suggests the possibility of an intraneural injection, and the needle should be immediately repositioned.

- Time to Produce Effect: Local anesthetic 30 minutes; no anesthetic 24 to 48 hours.
 - Frequency: Weekly, suggest no more than 4 injection sites per session per week to avoid significant post-injection soreness.
 - Optimal Duration: 4 Weeks.
 - Maximum Duration: 8 weeks. On rare occasions additional treatments may be warranted.
- e. **Prolotherapy:** also known as sclerotherapy, consists of a series of injections of hypertonic dextrose, with or without glycerine and phenol, into the ligamentous structures of the neck. There is no evidence that Prolotherapy is effective in cervical pain. The injections are invasive, may be painful to the patient, and are not generally accepted or widely used. Therefore, the use of Prolotherapy for cervical pain is not recommended.
- f. **Epiduroscopy and Epidural Lysis of Adhesions:** is not recommended in the cervical spine secondary to the potential for dural puncture, hematoma, and spinal cord injury.
4. **MEDICATION** use in the treatment of cervical injuries is appropriate for controlling acute and chronic pain and inflammation. Use of medications will vary widely due to the spectrum of injuries.

All drugs should be used according to patient needs. A thorough medication history, including use of alternative and over-the-counter medications, should be performed at the time of the initial visit and updated periodically. Treatment for pain control is initially accomplished with acetaminophen and/or NSAIDs. The patient should be educated regarding the interaction with prescription and over-the-counter medications as well as the contents of over-the-counter herbal products.

The following medications are listed in alphabetical order:

- a. **Acetaminophen** is an effective analgesic with antipyretic but not anti-inflammatory activity. Acetaminophen is generally well tolerated, causes little or no gastrointestinal irritation, and is not associated with ulcer formation. Acetaminophen has been associated with liver toxicity in overdose situations or in chronic

alcohol use. Patients may not realize that many over-the-counter preparations may contain acetaminophen. The total daily dose of acetaminophen is recommended not to exceed 4 grams per 24-hour period from all sources, including narcotic-acetaminophen combination preparations.

- Optimum Duration: 7 to 10 days.
- Maximum Duration: Chronic use as indicated on a case-by-case basis.

b. Anti-Depressants:

Recommendation: Tricyclic antidepressants (TCAs) are recommended for the treatment of chronic neck pain.

Indications: Chronic pain that is not fully treated with NSAIDs and an exercise program. This intervention may be helpful where there is nocturnal sleep disruption and mild dysthymia.

Frequency and Duration: Generally prescribed at a very low dose at night and gradually increased (e.g., amitriptyline 25 mg qhs, increase by 25 mg each week until a sub-maximal or maximal dose is achieved, sufficient effects are achieved, or adverse effects occur. Most practitioners use lower doses (e.g. amitriptyline 25-75 mg/day to avoid the adverse effects and necessity of blood level monitoring), as there is no evidence of increased pain relief at higher doses. Imipramine is less sedating, thus if there is carryover daytime sedation, this may be a better option.

Indications for Discontinuation: Resolution of the pain, intolerance, or development of adverse effects.

Recommendation: There is limited evidence that tricyclic antidepressants (TCAs) result in modest reductions in pain ratings in the treatment of radicular pain compared with placebo.

The indications, frequency, duration and indications for discontinuation are as above for chronic neck pain.

Recommendation: The selective serotonin reuptake inhibitors (e.g., paroxetine, as well as bupropion and trazodone) are not recommended for treatment of chronic neck pain. (They may be nevertheless recommended for treatment of depression as noted previously.) There is strong evidence that treatment with these

medications is not of benefit, thus their use is not recommended for the management of chronic neck pain without depression.

Recommendation: There is no quality evidence supporting the efficacy of antidepressants in the treatment of acute or subacute neck pain. Absent other indicators of a need for such treatment, this intervention is not recommended for the management of acute or subacute neck pain.

c. **Anti-Seizure Drugs:**

Recommendation: Topiramate for Chronic Neck Pain

Topiramate is recommended for limited use in select chronic neck pain patients, but not as a first line agent.

Indications for Initiation: Failure of multiple other modalities including trials of different NSAIDs, aerobic exercise, specific stretching exercise, strengthening exercise, tricyclic antidepressants, distractants, and manipulation.

Frequency/Dose: This medication is initiated by gradually increasing the dose. It has been initiated with a beginning dose of 50 mg and increasing by 50 mg a week. The most appropriate steady dose is unclear, but appears to be 300 mg. Patients should be carefully monitored for the development of adverse events.

Indications for Discontinuation: Resolution, development of adverse effects, or failure to adhere to a functional restoration program. Careful monitoring of employed patients is indicated due in part to elevated risks for central nervous system (CNS) sedating adverse effects.

Recommendation: Carbamazepine for Chronic Radicular or Neuropathic Pain

Carbamazepine is recommended as a potential adjunct for chronic radicular or neuropathic pain after attempting other treatments (e.g., other medications, aerobic exercise, other exercise, manipulation). While there is not quality evidence for treatment of chronic radicular neck pain, this may be tried if other medications have failed. Oxcarbazepine and lamotrigine may be useful agents to try if the results from carbamazepine are insufficient pain relief.

Frequency/Duration: Frequency and dosing are based on the medication prescribed.

Indications for Discontinuation: Resolution of neck pain, lack of efficacy, or development of side effects that necessitate discontinuation. Careful monitoring of employed patients is indicated due to elevated risks for CNS sedating adverse effects.

Recommendation: Topiramate for Neuropathic Pain

Topiramate is not recommended for neuropathic pain, including peripheral neuropathy.

Recommendation: Gabapentin and Pregabalin for Peri-operative Pain

Gabapentin is recommended for peri-operative management of pain to reduce need for opioids, particularly in those with side effects from opioids.

Indications: Peri-operative pain management.

Indications for Discontinuation: Resolution or intolerance. Careful monitoring of employed patients is indicated due in part to elevated risks for CNS-sedating adverse effects.

Recommendation: Chronic Non-Neuropathic or Chronic Neck Pain

Gabapentin is not recommended for chronic non-neuropathic or neck pain.

Recommendation: Chronic Radicular Pain

There is no recommendation for or against the use of gabapentin for chronic radicular pain syndromes as the evidence is conflicting.

Recommendation: Severe Neurogenic Claudication

Gabapentin is recommended for treatment of severe neurogenic claudication with limited walking distance.

Indications: Severe neurogenic claudication from spinal stenosis or chronic radicular pain syndromes.

Indications for Discontinuation: Resolution or intolerance. Careful monitoring of employed patients is indicated due in part to elevated risks for CNS-sedating adverse effects.

- d. **Narcotics** should be primarily reserved for the treatment of severe neck pain. In mild-to-moderate cases of pain, narcotic medication should be used cautiously on a case-by-case basis. Adverse effects include respiratory depression, the development of physical and psychological dependence, and impaired alertness. This medication has physically addictive properties and withdrawal symptoms may follow abrupt discontinuation.

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

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

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

abnormal liver function. Certain NSAIDs may have interactions with various other medications. Individuals may have adverse events not listed above. Intervals for metabolic screening are dependent upon the patient's age, general health status and should be within parameters listed for each specific medication. Complete blood count (CBC), and liver and renal function should be monitored at least every six months in patients on chronic NSAIDs and initially when indicated.

i. Non-selective Nonsteroidal Anti-Inflammatory Drugs (including ASA)

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

- Optimal Duration: 1 week.
- Maximum Duration: 1 year.

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

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

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

Selective COX-2 inhibitors should be used with great caution in patients with ischemic heart disease and/or stroke and avoided in patients with risk factors for coronary heart disease. Patients with known cardiovascular disease or multiple risk factors for cardiovascular disease should have the risks and benefits of NSAID therapy for pain discussed. In these patients, it appears to be safest to use acetaminophen or aspirin as the first-line therapy. If needed, NSAIDs that are non-selective are preferred over COX-2 specific drugs. Patients who receive COX-2 inhibitors should take the lowest effective dose for the shortest time necessary to control symptoms. Even a relative lack of COX-2 selectivity does not completely eliminate the risk of cardiovascular events, and in that regard, all drugs in the NSAID spectrum should only be prescribed after thorough consideration of risk/benefit balance. In patients receiving low-dose aspirin for primary or secondary cardiovascular disease prevention, to minimize the potential for the NSAID to counteract the beneficial effects of aspirin, aspirin should be taken at least 2 hours before or at least 8 hours after the NSAID.

- Optimal Duration: 7 to 10 days.
- Maximum Duration: Chronic use is appropriate in individual cases.

f. **Skeletal Muscle Relaxants:**

Recommendation: Muscle relaxants are not recommended for mild to moderate acute neck pain due to problems with adverse effects, nor are they recommended for chronic use in subacute or chronic neck pain (other than acute exacerbations).

Recommendation: Muscle relaxants are recommended as a second-line treatment in moderate to severe neck pain.

Indications: Recommended for selected cases of moderate to severe acute neck pain. For most cases, these agents are not recommended as other medication, progressive walking, and other exercises will be sufficient to control the symptoms. Generally, it is recommended that these agents be prescribed nocturnally initially and not during workdays or when patients plan to operate motor vehicles. Caution should be used in prescribing skeletal muscle

relaxants for those with a history of depression, personality disorder, substance addiction and/or abuse, including alcohol or tobacco. If a muscle relaxant is felt to be necessary in patients with those problems, cyclobenzaprine should be the drug tried since its chemical structure resembles a tricyclic antidepressant, and since addiction and abuse of this drug typically do not occur.

Frequency/Dose: This initial dose should be in the evening. Daytime use is acceptable in circumstances where there are minimal CNS-sedating effects and little concern about sedation compromising function or safety. There is no evidence of benefit from higher doses of medication (e.g., cyclobenzaprine 10 mg over 5 mg). If significant daytime somnolence results, then the medication may need to be discontinued, particularly if it interferes with performance of the aerobic exercise and other components of the rehabilitation plan. Another option is to decrease a dose of cyclobenzaprine by 50% to as little as 2.5 mg. It is not recommended that the first dose be taken prior to starting a work shift, or operating a motor vehicle or machinery.

Indications for Discontinuation: Resolution of the pain, non-tolerance, significant sedating effects that carry over into the daytime, or other adverse effects.

Recommendation: Muscle relaxants are recommended as second- or third-line agents for acute radicular pain syndromes or acute post-surgical situations. Other agents may be more efficacious for relieving radicular pain.

Indications: Moderate to severe radicular pain syndromes or post-surgical pain thought to be musculoskeletal in nature. Generally, muscle relaxants should be prescribed nocturnally initially and not during workdays or when patients plan on operating motor vehicles.

Frequency/Dose: The initial dose should be in the evening. Daytime use is acceptable in circumstances where there are minimal CNS sedating effects. If significant daytime somnolence results, then the medication may need to be discontinued, particularly if it interferes with the performance of aerobic exercise and other components of the rehabilitation plan.

Indications for Discontinuation: Resolution of the pain, non-tolerance, significant sedating effects that carry over into the daytime, or other adverse effects.

- Optimum Duration: 1 week.
- Maximum Duration: 2 weeks (or longer if used only at night).

g. Systemic Glucocorticosteroids (aka “Steroids”):

Recommendation: Glucocorticosteroids are recommended for treatment of acute severe radicular pain syndromes for purposes of obtaining a short-term reduction in pain.

Indication: Acute severe radicular pain.

Frequency/Dose: It is unclear whether parenteral administration or oral administration is more efficacious. In the absence of evidence, it is suggested that oral administration is preferable due to lower invasiveness and costs. It is recommended that only one course (5 to 14 days) of oral medication (i.e.: taper dose of methylprednisolone) be prescribed for a given episode of radicular pain. If additional treatment is needed, epidural steroid injections are preferable due to more direct route and targeting of the medication to the affected tissue.

Recommendation: Glucocorticosteroids are not recommended for acute, subacute, or chronic neck pain without radicular pain or mild to moderate radiculopathy. Oral steroids are not recommended for axial pain.

Recommendation: Intravenous steroids: The risks of permanent neurological damage from acute spinal cord compression generally outweigh the risks of pharmacologic side effects of steroids in an emergency situation. However, intravenous steroids are not recommended in settings other than acute neurological emergencies and should be confined to use only in the hospital setting with the intensity and duration of intravenous steroids to be determined in consultation with spinal cord experts.

h. Topical Drug Delivery:

Recommendation: Capsicum

Capsicum is recommended for treatment of acute and subacute neck pain, or temporary flare-ups of chronic neck pain. Long-term use is not recommended. Other creams and ointments may be

useful, although there is no quality evidence to guide recommendations.

Indications: For acute and subacute, and for temporary flare-ups of chronic neck pain, capsaicin is recommended for treatment. Providers should be aware that there are other treatments that appear to likely have greater efficacy (e.g., medications, progressive exercise program, etc.). However, capsaicin may be a useful adjunct. These compounds may also be used in those patients who prefer topical treatments over oral treatments and other more efficacious treatments, but have only mild neck pain.

Indications for Discontinuation: Resolution of neck pain, lack of efficacy, or development of adverse effects that necessitate discontinuation. Recommended not to be used more than 1 month as the costs become high and the patient should be transitioning to an active treatment program.

Recommendation: Other Creams and Ointments

Other creams and ointments may be used for treatment of acute, subacute, or chronic neck pain. However, there is no evidence of efficacy and no recommendation. Other agents and medicines have evidence of efficacy.

i. Tramadol:

Tramadol is useful in relief of pain and has been shown to provide pain relief equivalent to that of commonly prescribed NSAIDs. Although Tramadol may cause impaired alertness, it is generally well tolerated, does not cause gastrointestinal ulceration, or exacerbate hypertension or congestive heart failure. Tramadol should be used cautiously in patients who have a history of seizures or who are taking medication that may lower the seizure threshold, such as monoamine oxidase (MAO) inhibitors, SSRIs, and tricyclic antidepressants. This medication has physically addictive properties and withdrawal symptoms may follow abrupt discontinuation. It is not recommended for those with prior opioid addiction.

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

5. **Spinal Cord Programs:**

Spinal cord systems of care provide coordinated, case-managed, and integrated service for people with spinal cord dysfunction, whether due to trauma or disease. The system includes an inpatient component in an organization licensed as a hospital and an outpatient component. Each component endorses the active participation and choice of the persons served throughout the entire program. The spinal cord system of care also provides or formally links with key components of care that address the lifelong needs of the persons served.

This can include a highly structured program involving a team approach or can involve any of the components thereof. The interdisciplinary team should, at a minimum, be comprised of a qualified medical director who is board certified and trained in rehabilitation, a case manager, occupational therapy, physical therapy, psychologist, rehabilitation RN, physician and therapeutic recreation specialist. As appropriate, the team may also include: rehabilitation counselor, respiratory therapist, social worker, or speech-language pathologist.

Timeframe durations for any spinal cord program should be determined based upon the extent of the patient's injury and at the discretion of the rehabilitation physician in charge.

6. **ORTHOTICS:** Primary principles and objectives of the application of cervical orthosis include: (a) control of the position through the use of control forces; (b) application of corrective forces to abnormal curvatures; (c) aid in spinal stability when soft tissues or osteoligamentous structures cannot sufficiently perform their role as spinal stabilizers; and (d) restrict spinal segment movement after acute trauma or surgical procedure. In cases of traumatic cervical injury, the most important objective is the protection of the spinal cord and nerve root.

a. **Cervical Collars:**

- i. Soft Collars are well-tolerated by most patients but may not significantly restrict motion in any plane and are associated with delayed recovery. There is no evidence that their use promotes recovery from cervical sprain. In acute strain/sprain type injuries, use of cervical collars may prolong disability, limit early mobilization, promote psychological dependence, and limit self-activity. There is some evidence that patients encouraged to continue usual activity have less neck stiffness and headache than patients placed in cervical

collars following motor vehicle crashes. Their use is, therefore, not recommended.

- ii. Rigid Collars, such as a Philadelphia Orthosis, are useful post-operative or in emergency situations. These collars restrict flexion and extension motion, and to a lesser degree, lateral bending and rotation. Duration of wear post-surgery is dependent upon the physician and degree of cervical healing but is generally not used beyond 8 weeks.
 - b. **Poster Appliances** such as the Miami brace restrict flexion and extension motion to about the same degree as a Philadelphia collar, and to a greater degree, lateral bending and rotation. Not recommended in sprain or strain injuries.
 - c. **Cervicothoracic Orthosis** such as Yale and sternal occipital mandibular immobilization (SOMI) type braces, restrict flexion and extension motion to a fuller degree than the Philadelphia collar and to a better degree lateral bending and rotation. Not recommended in sprain or strain type injuries.
 - d. **Halo Devices** are used in the treatment of cervical fracture, dislocation, and instability at the discretion of the treating surgeon. Refer to Halo Immobilization in the Operative Therapeutic Procedures Section.
 - e. **Other Orthoses, Devices and Equipment:** Special orthoses or equipment may have a role in the rehabilitation of a cervical injury such as those injuries to a cervical nerve root resulting in upper extremity weakness or a spinal cord injury with some degree of paraparesis or tetraparesis. Use of such devices would be in a structured rehabilitation setting as part of a comprehensive rehabilitation program.
7. **PATIENT EDUCATION:** No treatment plan is complete without addressing issues of individual and/or group patient education as a means of prolonging the beneficial effects of treatment, as well as facilitating self-management of symptoms and injury prevention. The patient should be encouraged to take an active role in the establishment of functional outcome goals. They should be educated on their specific injury, assessment findings, and plan of treatment. Instruction on proper body mechanics and posture, positions to avoid, self-care for exacerbation of symptoms, and home exercise should also be addressed.

9. **RESTRICTION OF ACTIVITIES:** There is some evidence to support the continuation of normal daily activities as the recommended treatment for acute and chronic neck injuries without neurologic symptoms. Complete work cessation should be avoided, if possible, since it often further aggravates the pain presentation. Modified return-to-work is almost always more efficacious and rarely contraindicated in the vast majority of patients with cervical spine injuries.
10. **RETURN-TO-WORK:** Communication is essential between the patient, employer, and provider to determine appropriate restrictions and return-to-work dates. It is the responsibility of the physician to provide clear concise restrictions, and it is the employer's responsibility to determine if temporary duties can be provided within the restrictions.
- a. **Establishment of Activity Level Restrictions:** For cervical spine injuries, the following should be addressed when describing the patient's activity level:
- i. Total body position including upper trunk, especially rotation and flexion. To include duration and frequency.
 - ii. Upper extremity requirements including reaching above the shoulder, repetitive motions, pushing, pulling, and lifting or carrying requirements. Duration and frequency should be included.
 - iii. Sitting duration and frequency with regard to posture, work height(s), and movements of the head and neck.
 - iv. Visual field requirements in respect to limitations in head and neck movements and tolerance to looking upward and downward.
 - v. Use of adaptive devices or equipment for proper office ergonomics or to enhance capacities can be included.
- b. **Compliance with Activity Restrictions:** In some cases, compliance with restriction of activity levels may require a complete jobsite evaluation, a functional capacity evaluation (FCE), or other special testing.
11. **THERAPY, ACTIVE:** The following active therapies are based on the philosophy that therapeutic exercise and/or activity are beneficial for restoring flexibility, strength, endurance, function, range of motion, and can alleviate discomfort. Active therapy requires an internal effort by the individual to complete a specific exercise or task. This form of therapy

requires supervision from a therapist or medical provider such as verbal, visual, and/or tactile instruction(s). At times, the provider may help stabilize the patient or guide the movement pattern but the energy required to complete the task is predominately executed by the patient.

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

The following active therapies are listed in alphabetical order:

- a. **Activities of Daily Living (ADL)** involve instruction, active-assisted training, and/or adaptation of activities or equipment to improve a person's capacity in normal daily activities such as self-care, work re-integration training, homemaking, and driving.
 - Time to Produce Effect: 4 to 5 treatments.
 - Frequency: 3 to 5 times per week.
 - Optimum Duration: 4 to 6 weeks.
 - Maximum Duration: 6 weeks.
- b. **Aquatic Therapy:** Not recommended.
- c. **Functional Activities** are interventions which involve the use of therapeutic activities to enhance mobility, body mechanics, employability, coordination, balance, and sensory motor integration.
 - Time to Produce Effect: 4 to 5 treatments.
 - Frequency: 3 to 5 times per week.
 - Optimum Duration: 4 to 6 weeks.
 - Maximum Duration: 6 weeks.
- d. **Functional Electrical Stimulation** is the application of electrical current to elicit involuntary or assisted contractions of atrophied and/or impaired muscles. Indications include muscle atrophy, weakness, and sluggish muscle contraction secondary to pain, injury, neuromuscular dysfunction or where the potential for atrophy

exists. May be an appropriate treatment in conjunction with an active exercise program.

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

e. **Neuromuscular Re-education** is the skilled application of exercise with manual, mechanical, or electrical facilitation to enhance strength, movement patterns, neuromuscular response, proprioception, kinesthetic sense, and coordination, education of movement, balance, and posture. Indications include the need to promote neuromuscular responses through carefully timed proprioceptive stimuli, to elicit and improve motor activity in patterns similar to normal neurologically developed sequences, and improve neuromotor response with independent control.

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

f. **Spinal Stabilization:** The goal of this therapeutic program is to strengthen the spine in its neural and anatomic position. The stabilization is dynamic which allows whole body movements while maintaining a stabilized spine. It is the ability to move and function normally through postures and activities without creating undue vertebral stress.

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

g. **Therapeutic Exercise** with or without mechanical assistance or resistance, may include isoinertial, isotonic, isometric and isokinetic

types of exercises. Indications include the need for cardiovascular fitness, reduced edema, improved muscle strength, improved connective tissue strength and integrity, increased bone density, promotion of circulation to enhance soft tissue healing, improvement of muscle recruitment, improved proprioception and coordination, increased range of motion and are used to promote normal movement patterns. Therapeutic exercise can also include complementary/ alternative exercise movement therapy (with oversight of a physician or appropriate healthcare professional).

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

12. **THERAPY, PASSIVE** includes those treatment modalities that do not require energy expenditure on the part of the patient. They are principally effective during the early phases of treatment and are directed at controlling symptoms such as pain, inflammation and swelling. If employed, they should be used adjunctively with active therapies such as postural stabilization and exercise programs to help control swelling, pain, and inflammation during the active rehabilitation process. Passive therapies may be used intermittently as a therapist deems appropriate or regularly if there are specific goals with objectively measured functional improvements during treatment.

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

The following passive therapies are listed in alphabetical order:

- a. **Electrical Stimulation (Unattended):** Not recommended. For the purposes of these guidelines, unattended means that the physician or therapist is not physically present with the patient on a 1:1 basis when treatment is being administered.

- b. **Iontophoresis:** Not recommended.
- c. **Manipulation:** Manipulative treatment (not therapy) is defined as the therapeutic application of manually guided forces by an operator to improve physiologic function and/or support homeostasis that has been altered by the injury or occupational disease, and has associated clinical significance.

Contraindications to manipulation may include joint instability, fractures, severe osteoporosis, infection, metastatic cancer, active inflammatory arthritides, and signs of progressive neurologic deficits, myelopathy, vertebrobasilar insufficiency, or carotid artery disease. Relative contraindications include stenosis, spondylosis, and disc herniation.

- Time to produce effect for all types of manipulative treatment: 1 to 6 treatments.
 - Frequency: Up to 3 times per week for the first 4 weeks as indicated by the severity of involvement and the desired effect, then up to 2-treatments per week for the next 4 weeks. For further treatments, twice per week or less to maintain function.
 - Optimum Duration: 8 to 12 weeks.
 - Maximum Duration: 3 months. Extended durations of care beyond what is considered “maximum” may be necessary in cases of re-injury, interrupted continuity of care, exacerbation of symptoms, and in those patients with comorbidities.
- d. **Manipulation of the Spine under General Anesthesia (MUA):** Not recommended.
- e. **Manipulation under Joint Anesthesia (MUJA):** Not recommended.
- f. **Massage (Manual or Mechanical)** consists of manipulation of soft tissue with broad-ranging relaxation and circulatory benefits. This may include stimulation of acupuncture points and acupuncture channels (acupressure), application of suction cups and techniques that include pressing, lifting, rubbing, pinching of soft tissues by or with the practitioner's hands. Indications include edema (peripheral or hard and non-pliable edema), muscle spasm, adhesions, the

need to improve peripheral circulation and range of motion, or to increase muscle relaxation and flexibility prior to exercise.

As with all passive therapies, massage must be accompanied by exercise and patient education.

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

g. Mobilization (Joint) consists of passive movement involving oscillatory motions to the vertebral segment(s). The passive mobility is performed in a graded manner (I, II, III, IV, or V), which depicts the speed and depth of joint motion during the maneuver. It may include skilled manual joint tissue stretching. Indications include the need to improve joint play, segmental alignment, improve intracapsular arthrokinematics, or reduce pain associated with tissue impingement. Mobilization should be accompanied by active therapy. For Level V mobilization, contraindications include joint instability, fractures, severe osteoporosis, infection, metastatic cancer, active inflammatory arthritides, and signs of progressive neurologic deficits, myelopathy, vertebrobasilar insufficiency, or carotid artery disease. Relative contraindications include stenosis, spondylosis, and disc herniation.

- Time to Produce Effect: 6 to 9 treatments.
- Frequency: Up to 3 times per week.
- Optimum Duration: 4 to 6 weeks.
- Maximum Duration: 6 weeks.

h. Mobilization (Soft Tissue). Mobilization of soft tissue is the skilled application of muscle energy, strain/counter strain, myofascial release, manual trigger point release, and other manual therapy techniques designed to improve or normalize movement patterns through the reduction of soft tissue pain and restrictions. These can be interactive with the patient participating or can be with the patient relaxing and letting the practitioner move the body tissues. Indications include muscle spasm around a joint, trigger points,

adhesions, and neural compression. Mobilization should be accompanied by active therapy.

- Time to Produce Effect: 4 to 9 treatments.
- Frequency: Up to 3 times per week.
- Optimum Duration: 4 to 6 weeks.
- Maximum Duration: 6 weeks.

i. **Short-Wave Diathermy:** Not recommended.

j. **Superficial Heat and Cold Therapy (Excluding Infrared Therapy):** Superficial heat and cold are thermal agents applied in various manners that lower or raise the body tissue temperature for the reduction of pain, inflammation, and/or effusion resulting from injury or induced by exercise. It includes application of heat just above the surface of the skin at acupuncture points. Indications include acute pain, edema and hemorrhage, need to increase pain threshold, reduce muscle spasm, and promote stretching/flexibility. May be used in conjunction with other active therapy and may be self-administered by the patient.

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

k. **Traction - Manual** is an integral part of manual manipulation or joint mobilization. Indications include decreased joint space, muscle spasm around joints, and the need for increased synovial nutrition and response. Manual traction is contraindicated in patients with tumor, infection, fracture, or fracture dislocation.

- Time to Produce Effect: 1 to 3 sessions.
- Frequency: 2 to 3 times per week.

- Optimum Duration: 30 days.
- Maximum Duration: 1 month.

I. Traction - Mechanical is most commonly used for patients with radicular findings. It is sometimes used to treat symptoms from decreased joint space and muscle spasm around the joints. If successful it should be shifted to home traction. Traction modalities are contraindicated in patients with tumor, infections, fracture, or fracture dislocation. Non-oscillating inversion traction methods are contraindicated in patients with glaucoma or hypertension. A home cervical traction unit may be purchased if therapy proves effective.

- Time to Produce Effect: 1 to 3 sessions up to 30 minutes. If response is negative after 3 treatments, discontinue this modality.
- Frequency: 2 to 3 times per week. A home cervical traction unit may be purchased if therapy proves effective.
- Optimum Duration: 4 weeks.
- Maximum Duration: 4 weeks.

m. Transcutaneous Electrical Nerve Stimulation (TENS) treatment should include at least one instructional session for proper application and use. Indications include muscle spasm, atrophy and control of concomitant pain in the office setting. Minimal TENS unit parameters should include pulse rate, pulse width and amplitude modulation. Consistent, measurable, functional improvement must be documented and determination of the likelihood of chronicity prior to the provision of a home unit. TENS treatment should be used in conjunction with active physical therapy.

- Time to Produce Effect: Immediate.
- Frequency: Variable.
- Optimum Duration: 3 sessions.
- Maximum Duration: 3 sessions. Purchase or provide with home unit if effective.

- n. **Ultrasound (Including Phonophoresis)** uses sonic generators to deliver acoustic energy for therapeutic thermal and/or non-thermal soft tissue effects. Indications include scar tissue, adhesions, collagen fiber and muscle spasm, and the need to extend muscle tissue or accelerate the soft tissue healing. Ultrasound with electrical stimulation is concurrent delivery of electrical energy that involves dispersive electrode placement. Indications include muscle spasm, scar tissue, pain modulation, and muscle facilitation.

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

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

D. THERAPEUTIC PROCEDURES, OPERATIVE

All operative interventions should be based on a positive correlation with clinical findings, the natural history of the disease, the clinical course, and diagnostic tests. A comprehensive assimilation of these factors should have led to a specific diagnosis with positive identification of the pathologic condition(s). It is imperative for the clinician to rule out non-physiologic modifiers of pain presentation, or non-operative conditions mimicking radiculopathy or instability (peripheral compressive neuropathy, chronic soft tissue injuries, and psychological conditions), prior to consideration of elective surgical intervention. Early intervention may be required in acute incapacitating pain or in the presence of progressive neurological deficits. Patients who are not candidates for or refuse surgical treatment should be treated with non-operative therapy as indicated.

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

In situations requiring the possible need for re-surgery, a second opinion may be necessary. Psychological evaluation is strongly encouraged when surgery is being performed for isolated axial pain to determine if the patient will likely benefit from the treatment.

Interdisciplinary interventions should be strongly considered post-operatively in patients not making functional progress within expected time frames. Return to work activity restrictions should be specific. Most cervical non-fusion surgical patients can return to a limited level of duty between 3 to 6 weeks. Full activity is generally achieved between 6 weeks to 6 months, depending on the procedure and healing of the individual.

1. **ACUTE FRACTURES AND DISLOCATIONS:** Decisions regarding the need for surgery in acute traumatic injury will depend on the specific injury type and possibility of long-term neurologic damage. Acute disc herniations may occur in the presence of traumatic injury.

a. **Halo Immobilization:**

- i. Description: Intervention that restricts flexion-extension motion. Halo vest will provide significant but not complete rotational control and is the most effective device for treating unstable injuries to the cervical spine.
- ii. Complications: May include pin infection, pin loosening, and palsy of the sixth cranial nerve.
- iii. Surgical Indications: Cervical fractures requiring the need for nearly complete restriction of rotational control, and to prevent graft dislodgment, spine mal-alignment, or pseudarthrosis. Decision for use of halo is at the discretion of the surgeon based upon the patients' specific injury. Not indicated for unstable skull fractures or if skin overlying pin sites is traumatized.
- iv. Operative Treatment: Placement of the pins and apparatus.
- v. Post-Operative Therapy: Traction may be required for re-alignment and or fracture reduction (amount to be determined by surgeon), active and/or passive therapy, pin care.

b. **Anterior or Posterior Decompression with Fusion:**

- i. Description: To provide relief of pressure on the cervical spinal cord and nerve roots, and alignment and stabilization

of the spine. May involve the use of bone grafts, sometimes combined with metal devices, to produce a rigid connection between two or more adjacent vertebrae.

- ii. Complications: Instrumentation failure such as screw loosening, plate failure, or dislodgement (more common in posterior instrumentation), bone graft donor site pain, in-hospital mortality, deep wound infection, superficial infection, graft extrusion, cerebral spinal fluid (CSF) leak, laryngeal nerve damage (anterior approach), and iatrogenic kyphosis.
- iii. Surgical Indications: When a significant or progressive neurological deficit exists in the presence of spinal canal compromise. Whether early decompression and reduction of neural structures enhances neurological recovery continues to be debated. Currently, a reasonable approach would be to treat non-progressive neurological deficits on a semi-urgent basis, when the patient's systemic condition is medically stable.
- iv. Operative Treatment: Both anterior and posterior surgical decompression of the cervical spine are widely accepted. The approach is guided by location of the compressive pathology as well as the presence of other concomitant injuries. Posterior stabilization and fusion alone may be indicated for patients who have been realigned with traction and do not have significant canal compromise. The anterior approach is acceptable if there is disc and/or vertebral body anteriorly compromising the canal. The posterior approach may be indicated in radiculopathy in the absence of myelopathy and with evidence of pseudarthrosis on radiographs, or if the compression pathology is arising posteriorly.

The number of levels involved in the fracture pattern determines the choice between the use of wire techniques versus spinal plates. In injuries treated with an anterior decompression procedure, anterior bone grafting alone does not provide immediate internal fixation and an anterior cervical plate is significantly beneficial. Patients who undergo surgery for significant fracture dislocations of the spine (three-level injury) with canal compromise are best managed with anterior cervical decompression, fusion, and plating but in some cases posterior stabilization and fusion are also considered.

- v. **Post-Operative Treatment:** Cervical bracing may be appropriate (usually 6-12 weeks with fusion). Home programs with instruction in ADLs, sitting, posture, and a daily walking program should be an early part of the rehabilitation process. Referral to a formal rehabilitation program, with emphasis on cervical, scapular, and thoracic strengthening, and restoration of range of motion, is appropriate once the fusion is solid and without complication. Active treatment, which patients should have had prior to surgery, will frequently require a repeat of the sessions previously ordered. The goals of the therapy program should include instruction in a long-term home-based exercise program.

2. **DISC HERNIATION AND OTHER CERVICAL CONDITIONS:** Operative treatment is indicated only when the natural history of an operatively treatable problem is better than the natural history of the problem without operative treatment. All patients being considered for surgical intervention should undergo a comprehensive neuromuscular examination to identify pain generators that may respond to nonsurgical techniques or may be refractory to surgical intervention. Timely decision making for operative intervention is critical to avoid deconditioning, and increased disability of the cervical spine.

General Recommendations: There is some evidence to suggest that recovery from cervical radiculopathy in patients without clinical signs of spinal cord compression at one year is similar with one-level fusion, physical therapy, or rigid cervical collar use. For patients with whiplash injury (Quebec Classification Grade Levels I or II), there is no evidence of any beneficial effect of operative treatment.

If cervical fusion is being considered, it is recommended that the patient refrain from smoking for at least six weeks prior to surgery and during the time of healing. Because smokers have a higher risk of non-union and higher post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively.

General Indications for Surgery: Operative intervention should be considered and a consultation obtained when improvement of symptoms has plateaued and the residual symptoms of pain and functional disability are unacceptable at the end of six weeks of treatment, or at the end of longer duration of non-operative intervention for debilitated patients with complex problems. Choice of hardware instrumentation is based on anatomy, the patient's pathology, and surgeon's experience and preference.

a. Specific Indications include:

- i. For Patients with Myelopathy immediate surgical evaluation and treatment is indicated.
- ii. For Patients with Cervical Radiculopathy:
 - Early intervention may be required for acute incapacitating pain or in the presence of progressive neurological deficits.
 - Persistent or recurrent arm pain with functional limitations, unresponsive to conservative treatment after six weeks; or
 - Progressive functional neurological deficit; or
 - Static neurological deficit associated with significant radicular pain; and
 - Confirmatory imaging studies consistent with clinical findings.
- iii. For Patients with Persistent Non-radicular Cervical Pain:

While cervical fusion is appropriate treatment for neck pain due to degeneration with radiculopathy, there is no evidence that cervical fusion for neck pain alone produces results superior to conservative care. In the absence of a radiculopathy, it is recommended that a decisive commitment to surgical or nonsurgical interventions not be made within 4 to 5 months following injury. The effectiveness of cervical vertebral fusion for non-radicular pain has not been established. Therefore, it should not be routinely recommended. In patients with non-radicular cervical pain for whom fusion is being considered, required pre-operative indications include all of the following:

 - In general, if the program of non-operative treatment fails, operative treatment is indicated when:
 - ◆ Improvement of the symptoms has plateaued, and the residual symptoms of pain and functional disability are unacceptable at the end of 6 to 12 weeks of active treatment, or at the end of longer duration of non-operative

programs for debilitated patients with complex problems; and/or

- ◆ Frequent recurrences of symptoms cause serious functional limitations even if a non-operative active treatment program provides satisfactory relief of symptoms, and restoration of function on each recurrence.
- ◆ Mere passage of time with poorly guided treatment is not considered an active treatment program.
- All pain generators are adequately defined and treated; and
- All physical medicine and manual therapy interventions are completed; and
- X-ray, MRI, or CT/discography demonstrating disc pathology or spinal instability; and
- Spine pathology limited to two levels; and
- Psychosocial evaluation for confounding issues addressed.
- For any potential surgery, it is recommended that the patient refrain from smoking for at least six weeks prior to surgery and during the period of healing. Because smokers have a higher risk of non-union and higher post-operative costs, it is recommended that insurers cover a smoking cessation program peri-operatively.

b. Surgical Procedures include:

i. Cervical Discectomy with or without Fusion:

- Description: Procedure to relieve pressure on one or more nerve roots or spinal cord. It may be performed with or without the use of a microscope.
- Complications: May include strut graft dislodgment (multi-level decompression), infection, hemorrhage, CSF leak, hematoma, catastrophic spinal cord injury

causing varying degrees of paralysis, pseudarthrosis, in-hospital mortality, non-union of fusion, donor site pain (autograft only). Anterior approach: permanent or transient dysphonia, permanent or transitory dysphagia, denervation, esophageal perforation, and airway obstruction.

- Surgical Indications: Radiculopathy from ruptured disc or spondylosis, spinal instability, or patients with non-radicular neck pain meeting fusion criteria. There is no evidence that discectomy with fusion versus discectomy without fusion has superior long-term results. Discectomy alone is generally considered in patients with pure radicular symptoms from their herniated disc and who have sufficiently large foramen that disc space collapse is unlikely to further compromise the nerve root. Failure rates increase with disease at more than two levels.
- Operative Treatment: Cervical plating may be used to prevent graft dislodgment especially for multi-level disease.
- Post-Operative Therapy: Cervical bracing may be appropriate (usually 6 - 12 weeks with fusion). Home programs with instruction in ADLs, sitting, posture, and a daily walking program should be an early part of the rehabilitation process. Referral to a formal rehabilitation program, with emphasis on cervical, scapular, and thoracic strengthening and restoration of ROM is appropriate, once fusion is solid and without complication. Active treatment, which patients should have had prior to surgery, will frequently require a repeat of the sessions previously ordered. The goals of the therapy program should include instruction in a long-term home-based exercise program.

ii. Cervical Corpectomy:

- Description: Removal of a portion or the entire vertebral body from the front of the spine. May also include removal of the adjacent discs. Usually involves fusion.

- Complications: May include strut graft dislodgment (multi-level decompression), infection, hemorrhage, CSF leak, hematoma, catastrophic spinal cord injury causing varying degrees of paralysis, pseudarthrosis, in-hospital mortality, non-union of fusion, donor site pain (autograft only). Anterior approach: permanent or transient dysphonia, permanent or transitory dysphagia, denervation, esophageal perforation, and airway obstruction.
- Surgical Indications: Single or two-level spinal stenosis, spondylolisthesis, or severe kyphosis, with cord compression.
- Operative Treatment: Neural decompression, fusion with instrumentation, or halo vest placement to maintain cervical position. Hemisectorpomy may be done when only a portion of the vertebral body needs to be resected. Allografts may be used for single bone graft fusion; however, autografts are generally preferable for multi-level fusions unless a large strut graft is required.
- Post-Operative Therapy: Dependent upon number of vertebral bodies involved, healing time may be longer than discectomy. Halo vest care is required. Home programs with instruction in ADLs, sitting, posture, and a daily walking program should be an early part of the rehabilitation process. Referral to a formal rehabilitation program with emphasis on cervical, scapular, and thoracic strengthening is appropriate for most patients once the cervical spine is deemed stable and without complication. The goals of the therapy program should include instruction in a long-term home-based exercise program.

iii. Cervical Laminectomy with or without Foraminotomy or Fusion:

- Description: Surgical removal of the posterior portion of a vertebrae in order to gain access to the spinal cord or nerve roots.
- Complications: May include perineural fibrosis, kyphosis in fractures without fusion or with failed

fusion, nerve injury, post surgical instability (with foraminotomies), CSF leak, infection, in-hospital mortality, non-union of fusion, donor site pain (autograft only).

- Surgical Indications: Neural compression.
- Operative Treatment: Laminotomy, partial discectomy, and nerve root decompression.
- Post-Operative Therapy: Cervical bracing may be appropriate (usually 6 to 12 weeks with fusion). Home programs with instruction in ADLs, sitting, posture, and a daily walking program should be an early part of the rehabilitation process. Referral to a formal rehabilitation program with emphasis on cervical, scapular, and thoracic strengthening and restoration of range of motion is appropriate for most patients once the cervical spine is deemed stable and without complication. The goals of the therapy program should include instruction in a long-term home-based exercise program.

iv. Cervical Laminoplasty:

- Description: Technique that increases anterior or posterior dimensions of the spinal canal while leaving posterior elements partially intact. It may be performed with or without the use of a microscope.
- Complications: Loss of cervical motion, especially extension.
- Surgical Indications: Multi-level disease: cervical spinal stenosis or spondylitic myelopathy. Not indicated in cervical kyphosis.
- Operative Treatment: Posterior approach, with or without instrumentation.
- Post-Operative Therapy: May include 4 to 12 weeks of cervical bracing. Home programs with instruction in ADLs, sitting, posture, and daily walking program should be an early part of the rehabilitation process. Referral to a formal rehabilitation program with

emphasis on cervical, scapular, and thoracic strengthening and restoration of range of motion is appropriate once the cervical spine is stable and without complication. Active treatment which patients should have had prior to surgery will frequently require a repeat of the sessions previously ordered. The goals of the therapy program should include instruction in a long-term, home-based exercise program.

v. Percutaneous Discectomy:

- Description: An invasive operative procedure to accomplish partial removal of the disc through a needle which allows aspiration of a portion of the disc trocar under imaging control.
- Complications: Include, but are not limited to, injuries to the nerve or vessel, infection, and hematoma.
- Surgical Indications: Percutaneous discectomy is indicated only in cases of suspected septic discitis in order to obtain diagnostic tissue. The procedure is not recommended for contained disc herniations or bulges with associated radiculopathy due to lack of evidence to support long-term improvement.
- Operative Treatment: Partial discectomy.

3. **ARTIFICIAL CERVICAL DISC REPLACEMENT** involves the insertion of a prosthetic device into the cervical intervertebral space with the goal of permitting physiologic motion at the treated cervical segment. If cervical disc replacement is to be used, the most current FDA guidelines must be followed.
4. **PERCUTANEOUS RADIOFREQUENCY DISC DECOMPRESSION** of the cervical spine is an investigational procedure. There have been no randomized clinical trials of this procedure at this time. It is not recommended.
5. **EPIDUROSCOPY AND EPIDURAL LYSIS OF ADHESIONS:** Refer to Therapeutic Injections.
6. **INTRAOPERATIVE MONITORING** is a common intraoperative electrodiagnostic technique that may include somatosensory evoked

potentials (SSEP), motor evoked potentials (MEP), or pedicle screw monitoring. The monitoring procedure may be used to evaluate spinal cord integrity and screw placement during the operative procedure. The use of intraoperative monitoring can be anticipated to become more common as percutaneous spinal procedures gain greater acceptance.

APPENDIX

Sources:

This Treatment Guideline is adopted, with modification, from the State of Colorado's Cervical Spine Injury Medical Treatment Guideline with supplementation from ACOEM's¹ Occupational Medicine Treatment Guidelines.

¹ American College of Occupational and Environmental Medicine
Cervical Spine Injury