Pain is a complex phenomenon with various causes and issues associated with its occurrence. This complexity is especially true for those who have chronic pain. In light of the multifactorial nature of this problem, the treatment plan has to be individualized for each patient. The nonpharmacologic management of pain is the focus of this review article with an attempt to substantiate the individual components through the peer-reviewed medical literature. Strategies that have support in patients with chronic pain include the use of manipulation and mobilization, exercise, and psychological intervention; bed rest, bracing, and therapeutic modalities have not been validated in this patient population. The active use of heat modalities through a wearable wrap that allows patients to remain active during treatment has demonstrated efficacy in patients with acute pain and may be beneficial in patients with chronic pain, as well. The goal of treatment may not necessarily be to cure pain, but to manage it and restore functionality.

Acute pain is the normal physiologic response to a noxious chemical, thermal, or mechanical stimulus, and it usually is time limited. Chronic pain, however, is a state in which pain persists beyond the usual course of the disease and may cause intermittent or continuous pain for months or years. The limited objective findings encountered in the patient with pain makes quantification of the pain response difficult. These issues make it especially difficult to validate the level of pain between different patients with the same disease process. This article approaches the treatment regimen for patients with pain from a nonpharmacologic perspective, focusing on the literature dealing with nonpharmacologic treatment modalities for neck and low back pain (Figure). It is hoped that readers will be able to use the evidence presented to enhance their ability to treat these difficult patients.

Bed Rest
The use of prolonged bed rest in the treatment of patients with neck and low back pain and associated disorders is without any significant scientific merit. Bed rest supports immobilization with its deleterious effects on bone, connective tissue, muscle, and psychosocial well-being. For severe radicular symptoms, limited bed rest of less than 48 hours may be beneficial to allow for reduction of significant muscle spasm brought on with upright activity. Patients should be instructed to avoid resting with the head in a hyperflexed or extended position. The proactive approach emphasizes activity modification as opposed to bed rest and immobilization.

Two days of bed rest is commonly cited as the appropriate duration for the individual with low back pain, and though no literature exists to support the use of bed rest in neck pain disorders, 48 hours would be considered the window for bed rest in individuals with these conditions, as well. Elimination of bed rest has not been found to be detrimental to individuals with nonspecific neck or low back pain, and avoidance of such confinement may help to limit the unwanted side effects of the immobilization syndrome. It is suggested to avoid or limit bed rest with modification of activity as the ideal approach.

Bracing
Immobilization has been used for thousands of years to treat injuries to the human body. Unfortunately, immobilization may lead to deleterious effects that may compromise treatment outcome, such as muscle fiber atrophy, decreased proprioception, and loss of cervical and lumbar range of motion (ROM). This loss may be a clinically significant problem in an individual who already has compromised muscle function. McPartland et al demonstrated atrophy of the suboccipital muscles along with fatty infiltration in patients with chronic neck pain as compared with healthy control subjects.

In acute neck pain secondary to whiplash injury, Gennis et al demonstrated no advantage of a cervical collar in the treatment of patients with soft tissue injury with respect to the duration or degree of persistent pain as compared with matched control subjects treated without use of a cervical collar.

In regard to the treatment of patients with cervical radiculopathy, Persson et al...
demonstrated no significant advantage of a cervical collar over surgery or physiotherapy in the treatment of patients with chronic cervical radiculopathy. A cervical collar may be useful in the initial 48 to 72 hours after injury, especially in the face of neurologic compromise. Nothing exists to support continued use of cervical immobilization after this period of time.

Existing literature has failed to demonstrate the efficacy of lumbar bracing as a means to prevent low back injury in the workplace. In addition, lumbar bracing appears to not enhance dynamic lifting capacity, nor improve lumbosacral biomechanics. In fact, lumbar supports have not afforded more protection than a proper lift without the support. There may be a role after injury for the use of lumbar braces to prevent re-injury. This role has not clearly been established in the medical literature and probably is helpful as a proprioceptive reminder to use proper spine mechanics with lifting and bending activities.

**Manipulation and Mobilization**

Manipulative treatment is commonly used in the treatment of patients with neck pain and associated disorders. Many different types of manual treatment exist, including soft tissue myofascial release, muscle energy/contract-release, and high-velocity low-amplitude manipulation. Soft tissue myofascial release may include various techniques, including effleurage, pétrissage, friction, and tapotement. It has been shown to improve flexibility, decrease the perception of pain, and decrease the levels of stress hormones.

Cherkin et al demonstrated massage to be as effective as patient self-directed education and more effective than acupuncture. Mealy et al demonstrated that patients receiving mobilizing physical therapy showed significant improvements in cervical movement and pain 8 weeks after the accident compared with a group receiving the standard treatment of rest and a cervical collar.

Soft tissue myofascial technique may be useful in addressing myofascial restriction and should be considered an adjunct to exercise and postural training. Muscle energy techniques or patient-assisted mobilization requires the patient to resist movement taking into account the four planes of cervical motion. The desired response is improvement of motion restriction. Although no controlled trials have been done regarding patient-activated techniques, this low-risk, patient-controlled technique has potential advantage over more passive manipulative techniques.

**High-velocity, low-amplitude manipulative technique** is a component of both osteopathic and chiropractic manipulative treatment. Only highly trained practitioners should administer this technique and only after conducting a careful history and a thorough physical examination. Severe complications have been reported with these techniques, including stroke and spinal cord injury and have been mainly attributed to poor patient selection, inadequate training, and treatment with the patient’s neck in the extended plane. Despite these complications, the relative risk is low when taking into consideration the limited number of complications despite the millions of treatment sessions done yearly.

Qualified personnel have also supported a limited course of manipulative treatment as part of the consensus-based recommendation of the Quebec Task Force on Whiplash-Associated Disorders. Jette and Jette demonstrated in the treatment of 358 subjects with neck disability that treatment with mobilization and manipulation was associated with better outcome in health perceptions and decreased disability on the neck disability index. Hurwitz et al, in a meta-analysis of manipulation and mobilization for neck pain, demonstrated that in two of three controlled trials that short-term benefit was achieved using cervical mobilization for acute neck pain. No research into the number of sessions, frequency, and duration of manipulative treatment exists.

The initial manipulation prescription may be administered in conjunction with an exercise program for the first two weeks of treatment. Patient-activated treatment, termed muscle energy, can be incorporated at a frequency of up to two to three times per week and should be in conjunction with an active exercise program during the first month, as patient activation may be considered part of a strengthening program. Regularly scheduled follow-up visits are necessary to monitor for change in symptoms or physical examination findings (or both).

Clearcut goals of treatment should be established at the onset of treatment. A lack of improvement after three to four treatment sessions should result in a discontinuation of manipulation and a reassessment. Manual medicine treatment may thus be incorporated into the initial treatment of patients with acute neck pain to facilitate the patient’s active exercise program and should not be considered a stand-alone treatment strategy.

Manipulation and mobilization have gained support in the treatment of patients with acute low back pain. Although several studies have demonstrated the efficacy of manipulation and soft tissue mobilization in the treatment of patients with acute low back pain, some have not been found to be effective. The current literature is confounded by poor study design, execution, and poorly quantifiable objective measures. The consensus of the Agency for Health Care Policy and Research (AHCPR) guidelines was that manual...
medicine techniques can relieve acute pain and reduce symptoms in the initial 1 to 4 weeks of treatment. Manual medicine treatment may be incorporated into the initial treatment of patients with acute low back pain to facilitate the patients’ active exercise program.

Treating practitioners should be aware of the contraindications for manipulation, especially manipulation provided with the patient under general anesthesia, which has been demonstrated to be a high-risk practice. Although superior patient satisfaction levels have been demonstrated among those patients receiving manipulation-based care, no support exists for maintenance treatment once the painful episode has resolved.

Traction
Cervical traction is a therapeutic modality that can be administered with the patient in the supine or seated position. Traction may reduce neck pain and works through a number of mechanisms including passive stretching of myofascial elements, gapping of facet joints, improving neural foraminal opening, and reducing cervical disc herniation.24-27 It has been found to reduce radicular symptoms in individuals with confirmed radiculopathy and localized neck pain in individuals with cervicogenic pain and spondylosis.25-27 Cervical traction may be initiated during physical therapy with the patient properly instructed in home use. It is not a stand-alone treatment modality and should be done in conjunction with range-of-motion (ROM) exercises, appropriate strengthening, and correction of postural issues.

The use of lumbar traction has long been a preferred method of treating patients with lumbar disc problems. It requires approximately 1.5 times body weight to develop distraction of the vertebral bodies. This can be cumbersome and time consuming as well as difficult for most patients to tolerate. At the present time, no evidence exists in the peer-reviewed literature to support this form of treatment. No significant difference in outcome has been demonstrated with traction versus sham traction, with the group treated with traction having greater morbidity.28 Given the effectiveness of more active treatment, traction is generally not recommended in the treatment of patients with acute low back pain.

Therapeutic Modalities
Therapeutic modalities should be considered an adjunct to an active treatment program in the management of acute low back pain. They should never be used as the sole method of treatment. The prescribing physician should first be aware of all indications and contraindications for a prescribed modality and have a clear understanding of each modality and its level of tissue penetration.

The goals of treatment should be clear to the patient and the treating therapist from the onset of treatment. Patients are done an injustice when a therapeutic physical therapy program is modality intensive as opposed to exercise based. Jette and Jette29 demonstrated a poor functional outcome in patients treated with a passive, modality-intensive program compared with patients in an exercise-based program.

If at all possible, patients should be instructed in the use of simple modalities at home before their physical therapy sessions and in conjunction with their home exercise program. Overall, research to support the sustained use of therapeutic modalities in the treatment of neck pain is limited. According to the Quebec Task Force on Whiplash-Associated Disorders,16 modalities such as ice, moist heat, ultrasound, and massage are supported as optional adjuncts only in the first 3 weeks of treatment. Continued use of therapeutic modalities thereafter in isolation would not be scientifically supported.

Transcutaneous Electrical Nerve Stimulation
Transcutaneous electrical nerve stimulation (TENS) has been used to treat patients with various pain conditions, including neck and low back pain. Success may be dictated by many factors, including electrode placement, chronicity of the problem, and previous modes of treatment.29 TENS is generally used in chronic pain conditions and not indicated in the initial management of acute cervical or lumbar spine pain.30-32 Overall, research is limited in regard to the isolated use of TENS in the treatment of patients with acute cervical and lumbar spine disorders, though it has been used in combination with ROM exercises, spray and stretch, and myofascial release.33

TENS should not be initiated until an adequate trial of pharmacologic intervention has been attempted to reduce pain. TENS can be costly and compliance with treatment is questionable.34 When TENS is used, documentation of greater than 50% reduction in pain with a treatment trial may help substantiate its true beneficial effects as opposed to a placebo response.35

Electrical Stimulation
High-voltage pulsed galvanic stimulation has been used in acute neck pain to reduce muscle spasm and soft tissue edema. It is commonly used despite the lack of hard scientific evidence for its efficacy. Its effect on muscle spasm and pain is thought to occur by its counterirritant effect on nerve conduction and a reduction in muscle contractility. Use of electrical stimulation should be limited to the initial stages of treatment, such as the first week after injury, so that patients may quickly progress to more active treatment that includes restoration of ROM and strengthening.32 Electrical stimulation often may be combined with ice or heat to enhance its analgesic effects.

Ultrasound
Ultrasound is a deep-heating modality that is most effective in heating structures such as the hip joint, which superficial heat cannot reach. It has been found to be helpful in improving the distensibility of connective tissue which facilitates stretching.36,37 It is not indicated in acute inflammatory conditions where it may serve to exacerbate the inflammatory response and typically provides only short-term benefit when used in isolation. It is perhaps best used in the region of the upper trapezius or lumbar paraspinals to facilitate active stretching and strengthening.

Ultrasound should not be used over the anterolateral aspect of the neck where the close proximity of the cervical or brachial plexus may result in alterations of membrane stability with potential
harm to the patient. In addition, ultrasound is contraindicated over a previous laminectomy where similar effects may occur. It should be discontinued as motion is improved, with progression into a more active stretching, strengthening, and home exercise program.37

Superficial Heat
Superficial heat can produce heating effects at a depth limited to between 1 cm and 2 cm. Deeper tissues are generally not heated owing to the thermal insulation of subcutaneous fat and the increased cutaneous blood flow that dissipates heat. It has been found to be helpful in diminishing pain and decreasing local muscle spasm. Superficial heat, such as the hydrocollator pack, should be used as an adjunct to facilitate an active exercise program. It is most often used during the acute phases of treatment when the reduction of pain and inflammation are the primary goals. Jette and Jette37 demonstrated a significantly poorer outcome in subjects with neck pain treated with heat and cold modalities as compared with active exercise-based treatment. The reason for this phenomenon may be linked to the need for relative immobilization during therapeutic modality use without active exercise-based treatment.38,39

Continuous low-level heat therapy is a new concept in superficial heat treatment that allows for active as compared with passive use of therapeutic heat. It has demonstrated effectiveness in reducing pain, decreasing muscle stiffness, improving flexibility, and decreasing disability.40 If this therapy is beneficial, patients should be educated on the use of the heat wrap and apply it on a home basis before their therapy or home exercise program.

Cryotherapy
Cryotherapy can be achieved through the use of ice, ice packs, or continuously via adjustable cuffs attached to cold water dispensers. Intramuscular temperatures can be reduced by between 3°C and 7°C, which functions to reduce local metabolism, inflammation, and pain. Cryotherapy works by decreasing nerve conduction velocity, termed cold-induced neuropraxia, along pain fibers with a reduction of the muscle spindle activity responsible for mediating local muscle tone.41,42 It is usually most effective in the acute phase of treatment, though it can be used by patients after their physical therapy sessions or their home exercise program to reduce pain and the inflammatory response.

Cryotherapy is applied over a region for 15 to 20 minutes, three or four times per day initially and then on an as-needed basis. Peripheral nerve injury and local frostbite secondary to prolonged cryotherapy has been described; therefore, cryotherapy should not be directly applied over peripheral nerves or the skin for sustained periods unmonitored.43-47

Exercise
Correction of posture may be the simplest technique to relieve symptoms in patients with nonspecific neck or low back pain, though it is extremely difficult to change habits. The physician should instruct patients to assume their worst postural “slump position” with forward protrusion of the head, flexion of the neck, rounding of the shoulders, and increased thoracic kyphosis and reversed lumbar lordosis while sitting. Next, the physician should instruct patients to correct these postural abnormalities through retraction and extension of the head, retraction of the shoulders, extension of the thoracic spine, and return of the lumbar lordosis.

Pearson et al48 demonstrated in a trial of repeated neck retractions that ROM was not affected, but resting posture was significantly improved. Black et al49 demonstrated the effects of sitting posture on neck positioning with increased lumbar kyphosis resulting in neck extension, whereas sitting erect resulted in relative neck flexion. Postural exercises with neck retractions and correction of lumbar lordosis would therefore be considered an early strategy to obtain functional recovery. Range of motion exercises should be done in a pain-free range in all four planes of motion (flexion/extension, sidebending, and rotation) on a daily basis.

In conjunction with ROM exercises, flexibility exercises should be added to address muscles restricted by the lack of neck motion. Although flexibility exercises have not been specifically described, clearly stretching of the upper trapezius, levator scapula, and scalenes (anterior, middle, posterior) would not be deleterious in most patients with nonspecific neck pain while stretching the quadratus lumorum along with the deeper lumbar musculature and may serve to improve overall ROM and function in the lumbar spine. Hanten et al50 demonstrated sustained stretching to be superior to active ROM when used as part of a home exercise program.

Caution should be observed in the case of radiculopathy and cervical spondylotic myelopathy where extension or rotatory movements (or both) of the cervical spine may exacerbate symptoms. Isometric strengthening of the cervical spine musculature should be appropriately done, addressing frontal, sagittal, and transverse plane motion. Highland et al51 demonstrated significant reductions in pain and improved isometric strength and ROM in patients with degenerative disc disease, herniated discs, and cervical strains who were placed on an 8-week program of isometric strengthening and ROM exercises. Caution must be observed in prescribing isometric exercises to anyone with concomitant hypertension or cardiac issues. In such individuals, isotonic strengthening may be preferred. Compared with individuals treated with passive modalities, individuals with disability from neck pain had superior physical functioning with the inclusion of flexibility and strengthening exercises.17

Jordan et al52 demonstrated in a group of individuals with chronic neck pain, no significant difference in outcome between groups treated with intensive muscle strengthening, heat or cold modalities, or manipulation at 4- and 12-month follow-up except for a significant increase in endurance in the group treated with intensive strength training.52 Overall, a comprehensive program incorporating flexibility, ROM, and postural correction with strengthening is clinically supported in the treatment of patients with neck pain and associated disorders.

In the lumbar spine, studies have demonstrated a reduction in aerobic fitness level in patients with low back
pain.53-55 Some raise questions as to which is the cause and which is the effect. Cady and colleagues’ study on firefighters is often cited to support the importance of aerobic fitness in the prevention and treatment of acute low back pain.53 Unfortunately, this study did not measure the incidence of low back pain but instead, analyzed on-the-job low back injury that required missed work. The firefighters with a lower fitness profile had a greater number of missed work days from low back injury. Cady et al54 did find that the firefighters with improved aerobic fitness did have fewer missed days from work because of low back injury independent of age.

Aerobic exercise may also decrease the psychological impact of low back pain by improving mood, decreasing depression, and increasing pain tolerance.59 Theoretically, aerobic exercise may help to improve the body’s ability to break down scar tissue via tissue plasminogen activator.57 Improvement of aerobic fitness is a reasonable goal in conjunction with an active exercise program that emphasizes restoration of normal lumbosacral motion, trunk strengthening, and instruction in proper body mechanics. A program of aerobic exercise alone would be overly simplistic, unlikely to benefit most patients, and potentially pain provoking. Deconditioning should be avoided at the onset by limiting bed rest and immobilization. Patients who are significantly deconditioned should be instructed in the basics of aerobic exercise, including a proper warmup, cooldown, and an assessment of target exercise intensity by heart rate or rating of perceived exertion.

Conflicting literature exists on the efficacy of strengthening exercises in the treatment of patients with acute and chronic low back pain.58-61 Some of this conflicting literature is due to poor study design, difficulty in randomization, and the lack of specific diagnosis in most studies.60,61 There has also been debate over the merits of flexion versus extension exercises for the treatment of patients with various low back conditions.52,63 Some studies have shown that flexion exercises are helpful in patients with posterior element dysfunction, such as spondylolysis and spondylolisthesis.52 Others have demonstrated the efficacy of an extension-based program in patients with discogenic low back pain.63,64 Unidirectional exercises by themselves are essentially too simplistic to address the multitude of pathophysiologic changes that occur with acute and recurrent low back pain episodes.

Movement of the upper and lower extremities in various planes provides a progressive challenge while patients are in therapy and later during their performance of work and activities of daily living. The overall goal of this comprehensive exercise program is to reduce pain, develop the muscular support of the trunk and spine, and to diminish stress to the intervertebral discs and other static stabilizers of the spine.

Therapy sessions should be actively directed and limited to a number of sessions that ensures that patients have a conceptual understanding of the entire program, demonstrate good technique in doing the exercises, and can do them independently at home. In addition, activity-specific training should be incorporated so that patients are instructed to maintain a neutral spine and dynamic muscle support of their spine in all activities of daily living, work, and recreation. These comprehensive programs have now been well documented, and they are commonly used in the treatment of individuals with chronic pain.61-64

Patient Education
It is essential that patients have an understanding of the likely etiology of their pain. The education of patients should include a review of the basic anatomy and biomechanics of the spine and the etiology of patients’ complaints. The treatment plan should be discussed and should include a description of recommended imaging studies, medications, injections, and therapeutic exercise. Physicians should review proper posture, biomechanics of the spine in activities of daily living, and simple methods to reduce symptoms. Proper education ensures that patients will become active participants in their treatment as they progress to a more comprehensive home exercise program. Patients must be made to understand the necessary commitment to their program, as poor compliance with treatment may be a risk factor for poor patient outcome.

Patients must be made to understand that their neck pain may not be cured but managed and that when they hurt, it does not mean they are always causing themselves harm. Physicians therefore must consider patient education an ongoing process that must be continually refined.

Psychological Intervention
Chronic neck and low back pain in our society is a direct result of a complex interaction between medical and psychosocial factors. Spengler et al65 demonstrated that while up to 50% of the workforce report limitations secondary to low back pain, only between 3% and 5% file a workers’ compensation claim. Troup et al66 demonstrated that the patients’ perceived physical capacities were more predictive of future injury than measured capacities. A psychological assessment may be invaluable to determine the extent of overlay that may be having an impact on functional recovery from an episode of neck or low back pain.

Mannion et al67 demonstrated that the use of psychological questionnaires such as the Modified Somatic Perception and Zung Questionnaires were predictive of patients in whom serious back pain was likely to develop. Pain diagrams may also be clinically useful and, in the hands of trained personnel, may help predict patients with nonorganic causes of back pain.68 Early identification of psychosocial problems may be important in understanding and possibly preventing chronicity.69

Although many studies have reported psychological factors noted in patients with acute pain to ultimately lead to chronicity, others deem them unrelated, with stronger correlations to job satisfaction, marital status, education, and pending litigation.70-77 Various batteries of tests exist in the psychological milieu and should be administered by an appropriately trained psychiatrist or psychologist. Overall, psychosocial factors may play a role in those patients with neck or low back pain by altering their response to symptoms and treatment.19
Comment

Chronic pain can be a difficult problem to properly diagnose and treat. Physicians managing individuals with pain must understand the anatomy and pathophysiology of the various conditions affecting the human body as well as the mechanism and biomechanics to support the various treatment strategies. Physicians must use all the available modalities, both pharmacologic and nonpharmacologic, in managing chronic pain. They must use the existing scientific evidence to guide the treatment program as using unproved methods may affect outcome. At times, thoughtful review of the available literature provides a basis for the use of unproved treatment methods in those patients who are failing to respond to “approved” techniques.

Considering the cost of chronic pain, it is imperative that patients affected by chronic pain be treated aggressively and preferably in the acute stage when it is easier to obtain significant results. The goal of this article is to provide the evidence behind the nonpharmacologic strategies of pain management to ultimately improve the care of patients who have chronic pain.

References


