Focusing on Wellness
A Message from Edward C. Benzel, M.D.

The information is applicable to all of us, whether we are physicians or the lay public. Of note, it all comes from within our own program: the Cleveland Clinic Center for Spine Health.

Spine health — what a concept! The term ‘Center for Spine Health,’ as an iconic representation and embodiment of the purpose and mission of the Center, was not chosen haphazardly or by chance. It was carefully chosen to be reflective of the ‘new’ way in which spine care is to be delivered. A focus on health, as it pertains to the entirety of spine care, is thus emphasized. Wellness (the act of preventing disease) forms the foundation for spine health and spine care. The remainder of spine care in patients with active spine pathology or disease — whether it is physical therapy, spine manipulation or surgery — is designed to achieve, or at least approach or approximate, spine health.

We will continue to see more and more of a focus on spine health and wellness. This has, in fact, become a major focus of international organizations, such as the World Spine Society. It most certainly is our focus at Cleveland Clinic, as well. This focus is manifested by the Center for Spine Health’s emphasis on a multidisciplinary approach to spine care, as well as the employment of a variety of strategies, including aggressive manipulation, acupuncture and physical (and mental) restoration programs that all further emphasize the importance of exercise and nutrition. Patient pathologies are seldom simple or straightforward. A multifaceted approach to such pathologies therefore usually is warranted — and is the focus of our care at the Cleveland Clinic Center for Spine Health.

So, let’s all promote spine health. In so doing, I invite you to read and enjoy this edition of Spinal Column.
Correcting Somatic Dysfunction with Spinal Manipulation: A Treatment for the Ages

By Fredrick P. Wilson, D.O.

Spinal manipulation has been practiced for thousands of years. It was depicted in ancient hieroglyphic forms, and it was practiced by Hippocrates and by the physicians of imperial Rome. The tradition was continued and passed on by “bonesetters” in medieval Europe and, in the 1870s, A.T. Still, M.D., established osteopathic manipulation as a legitimate medical discipline.

Besides acupuncture, osteopathic medicine is likely the oldest method of promoting wellness and good health.

Osteopathic spinal manipulation is based on treating somatic dysfunction. Everyone has some degree of somatic dysfunction, which is defined as an impairment or alteration in the function of related components of the body’s framework (i.e., the somatic system). This system includes skeletal, arthrodial and myofascial structures and related vascular, lymphatic and neural elements.

The essentials of spinal manipulation

In regards to the spine, somatic dysfunction typically involves localized restrictions between neighboring spinal vertebrae. These restrictions are believed to be caused by the contraction of small muscles attached to the vertebra. Somatic dysfunction can be caused by a physical trauma, such as a fall, or by a series of microtraumas that occur repeatedly, such as those experienced when one puts one’s body in an unnatural position for an extended period of time.

Everyone has some degree of somatic dysfunction, which is defined as an impairment or alteration in the function of related components of the body’s framework (i.e., the somatic system).

Once a vertebra is out of its normal resting position (see the figure), nerve receptors in the contracted muscles and ligaments become stimulated. This information is relayed back to the spinal cord. The segment of the spinal cord that receives this information is itself stimulated (facilitated). This segment of the spinal cord normally is responsible for maintaining resting muscle tone in the local muscles. When the nerves in this segment become facilitated, the normal resting muscle tone of the local muscles becomes increased. This increase keeps the muscles contracted (tight), which in turn keeps the vertebra in its new pathologic neutral position.

Somatic dysfunction can be acute (a few days) or chronic. A trained examiner can differentiate between acute and chronic dysfunction by palpating the skin along the spine. In acute somatic dysfunction, the skin feels warm, sweaty and swollen, and it is tender to the touch. In chronic dysfunction, the area feels cool, dry and ropy. These local changes occur because the nerves coming from the facilitated segment of the spinal cord produce chemical changes that decrease local blood flow and cause low-grade inflammation. If an acute somatic dysfunction persists and becomes chronic, the inflammation subsides. In addition to palpating the skin along the spine, specialists in spinal manipulation find somatic dysfunction by looking for spinal asymmetry and a restricted range of motion between vertebrae. Spinal manipulation corrects somatic dysfunction by decreasing abnormal neural tone in the facilitated segment of the spinal cord. This can reduce or reset the local muscle contraction that holds the vertebra in somatic dysfunction and lead to a more normal range of motion.

It also improves local blood circulation and reduces tissue swelling and pain.

Spine Health osteopathic physician certified in neuromusculoskeletal medicine and osteopathic manipulative medicine.

Fredrick Wilson, D.O., is a Cleveland Clinic Center for Spine Health osteopathic physician certified in neuromusculoskeletal medicine and osteopathic manipulative medicine.

If spinal manipulation is performed on such a vertebra, it not only will help correct the somatic dysfunction, but it also can improve circulation to the irritated organ and reduce the increased neural tone of the spinal cord segment. This is how spinal manipulation has been used for millennia to treat medical illness as well as back and neck pain. Much research continues to be done in an effort to further understand the mechanisms and effects of spinal manipulation. Few treatments have survived the test of time as long as spinal manipulation has.

If somatic dysfunction is present, the vertebral segment will not lie in the midline position, and the patient will not be able to rotate the vertebral segment past the restrictive (or pathologic) barrier.
Smoking: The Awful Truth

By Paula Lidestri, M.D.

1.3 billion THE NUMBER OF PEOPLE WORLDWIDE WHO SMOKE
60.7 million THE ESTIMATED NUMBER OF AMERICANS WHO SMOKE
400,000 THE NUMBER OF DEATHS IN THE U.S. EACH YEAR THAT ARE DIRECTLY ATTRIBUTABLE TO SMOKING
12 THE AVERAGE NUMBER OF YEARS OF LIFE EXPECTANCY THAT ARE LOST SECONDARY TO SMOKING
200 billion THE ESTIMATED NUMBER OF U.S. DOLLARS SPENT YEARLY ON SMOKING-RELATED DISEASES

By now, most people are aware of the deleterious effects that smoking has on cardiovascular and pulmonary health. Still, the effects of smoking extend far beyond the heart and lungs. In fact, smoking negatively affects almost every system in the body, including the spine.

Among the spine-related diseases that are associated with smoking are chronic neck pain and chronic back pain. In one study published in the Annals of Rheumatic Diseases, it was estimated that smoking raised the risk of debilitating back pain by 30 percent.1

While there is a definite link between smoking and back pain/disc degeneration, the specific mechanism by which smoking exerts its effects on the spine still remains a point of debate. Two likely culprits are a decrease in blood flow and an impairment of bone metabolism. Cough also may play a role.

Decreased blood flow

Smoking reduces blood flow to the spine, which negatively affects metabolism and accelerates the degenerative process. A degenerative spine is theoretically more susceptible to mechanical stress and injury.

A look at literature offers some details:

- Iwashashi et al. investigated changes in the capillary network surrounding the disc in a rabbit model.2 They found that nicotine reduced the vascular budding around the discs, induced vasoconstriction, increased tissue degeneration and inhibited proteoglycan and collagen synthesis.
- Ernst suggested several mechanisms by which smoking may decrease blood flow:
  - a hemorheologic defect that leads to increased viscosity
  - Oda et al. exposed rats to tobacco smoke (the equivalent of 10 cigarettes per day for up to 8 weeks).3 Thereafter, they measured nicotine levels and performed histologic and immunologic studies. They found that the rats that were exposed to smoke exhibited a dose-related derangement in disc structure and biologic activity that was not seen in the control rats. The smoke-exposed rats also demonstrated a disordered annulus fibrosus, with numerous cracks and chordocyte swelling, which is assumed to be associated with decomposition of chordocyte activity. Finally, the rats that were exposed to the smoke had significantly higher interleukin-1β (inflammatory cytokine) levels.

Impaired bone metabolism

Another mechanism by which smoking negatively affects the spine has to do with its effect on bone mineralization. Nicotine slows the production of osteoblasts (bone-forming cells) and impairs the absorption of calcium. This results in a diminution of the mineral content in bone, which can contribute to the development of osteoporosis. Osteoporotic vertebral bodies are assumed to be more susceptible to trabecular microfractures, which may contribute to chronic pain. Furthermore, female smokers tend to experience menopause earlier than nonsmokers secondary to a decrease in estrogen production, and this also contributes to increased bone loss.

Cough

Chronic coughing and chronic bronchitis, conditions common in smokers, have been implicated as contributing factors in the development of herniated discs. In an epidemiologic review of acute herniated lumbar intervertebral discs, Kelsey noted an association between herniated discs, coughing and smoking.4 She proposed the idea that smoking increases intervertebral disc damage via increased coughing activity, which in turn increases intra-abdominal and intradiscal pressure.

The benefits of quitting

While the precise cause-and-effect relationship has not been definitively established between smoking and neck/back pain, there is a reasonable amount of evidence to suggest that smoking creates a biologic environment that is conducive to the initiation and exacerbation of neck and back pain. Smoking also is associated with other unhealthy factors (sedentary lifestyle, poor diet, obesity) that contribute to chronic pain, especially back pain.

It’s never too late to quit. Deyo and Bass reported that the prevalence of low back pain was the same in nonsmokers as in ex-smokers who had stopped smoking for 10 years or more.5 Quitting smoking may also reduce the risk of low bone mass and fractures, although this benefit may also take several years to manifest.

Considering all the potential negative effects of smoking, smoking cessation is probably the single most important step one can take to effect a positive change on not just the spine, but on one’s overall health.

Paula Lidestri, M.D., is a physical medicine and rehabilitation specialist with subspecialty in interventional and medical spine at the Cleveland Clinic Center for Spine Health. She specializes in the evaluation and non-operative treatment of neck and back pain and general musculoskeletal disorders, spine wellness and interventional spine techniques.

Debunking the Myths: Exercise and the Maintenance of a Healthy Spine

By Stephanie Muzevich, MPT, and Erin Johnson, DPT

Injury prevention is a controversial issue in the wellness population. Many exercise myths exist that are related to the maintenance of a healthy spine. Although little is known about injury prevention and the source of chronic back pain, the importance of an active lifestyle emerges time and time again.

Many common beliefs are held by the public regarding wellness; however, surprising research findings are debunking old beliefs and changing the way physical therapists practice today. Listed below are examples of these beliefs and whether they continue to hold true.

Strong core muscles will help prevent back pain and injury.

FACT AND MYTH. We now understand that the core, or abdomen, plays a crucial role in spine health. Strength in the transversus abdominis and erector spine muscles facilitate the ability to stabilize the spine naturally. Unfortunately, strength alone will not protect the spine from the everyday wear and tear we subject our bodies to with improper body mechanics and poor postural awareness. Maintaining a position of spinal alignment or neutral spine position that maintains the natural curves in the spine is paramount. Neutral spine position not only plays a role in protecting the spine during heavy physical activity, such as lifting weights, but also during sedentary activities, such as sustained sitting or standing. Developing the strength, endurance and coordination to stabilize the spine will make it easier to maintain proper alignment for longer periods of time, thus reducing abnormal forces on the spine. It would be outrageous to suggest that anyone could maintain a neutral spine position throughout the day, but making a conscious effort to improve posture and taking note of spinal position during lifting or carrying can decrease the load on the spine and prolong tolerance for continued activity.

Core muscles include the erector spine, rectus and transversus abdominis, abdominal obliques, gluteus maximus and medius, and pelvic floor muscles. The best way to strengthen the spine is to perform sit-ups.

MYTH. Performing sit-ups is an effective method for strengthening abdominal muscles, particularly the rectus abdominis and hip flexors. However, given the compromising position of lifting the weight of the trunk into end-range lumbar flexion, this exercise frequency is deemed risky, even in the healthy spine population. A variety of more conservative options for strengthening the muscles around the spine include targeting the transversus abdominis, obliques and, equally important, the spinal extensors.

Initial transversus abdominis strengthening is taught in the supine position, maintaining the natural lumbar lordosis. A drawing-in maneuver has been described by a number of clinicians and researchers whereby the navel is drawn downward toward the spine. “The client is instructed to continue breathing normally while isometrically contracting the abdominal muscles. Once the client is able to isolate the abdominal muscles without performing a pelvic tilt, the exercise is advanced to include arm and/or leg movements while the client continues to maintain a neutral spine position (see figure 1).”

Strengthening of the erector spine muscles may be performed in a variety of positions as well. Initially, strengthening frequency is taught in the prone position, with cueing to engage the abdominal muscles using the drawing in technique. A phenomenon has been described in the literature whereby automatic co-contraction of the multifidi muscles occurs during activation of the transversus abdominis on electromyography analysis. This co-contraction serves to stabilize the spine multidimensionally. Further challenge to the erector spine muscle group can be achieved through arm and/or leg lifts against gravity (see figure 2).

Isolating the erector spine or abdominal muscles is not always indicated in the healthy population. Functional strengthening such as lunges, squats and activities that challenge the balance systems are an excellent option for core strength, spine health and preservation of function. Simply activating the abdominal muscles and maintaining a neutral spine position during functional strength training and cardiovascular exercise can incorporate core strengthening into a variety of exercises and activities to reinforce a healthy spine and waistline.

Bicycling and swimming will maintain bone density in the spine.

MYTH. Although bicycling and swimming are both excellent forms of cardiovascular exercise, weight-bearing activity decreases sports-related injury or facilitates muscle performance. Evidence even suggests a temporary decline in muscle activation immediately after stretching. Physiologically, it is thought that the mechanoreceptors activated during stretching actually serve to inhibit motor performance. Despite the controversy surrounding this issue, the bulk of evidence suggests that an active warm-up gradually prepares the body for the activity to be undertaken and is effective in reducing the risk of injury.

Strong transversus abdominis exercises can help strengthen the spine.

Figure 1: Transversus abdominis exercises can help strengthen the spine.

Cross-training is essential for continued activity.

FACT AND MYTH. Performing sit-ups is an effective method for strengthening abdominal muscles, particularly the rectus abdominis and hip flexors. However, given the compromising position of lifting the weight of the trunk into end-range lumbar flexion, this exercise frequency is deemed risky, even in the healthy spine population. A variety of more conservative options for strengthening the muscles around the spine include targeting the transversus abdominis, obliques and, equally important, the spinal extensors.

Initial transversus abdominis strengthening is taught in the supine position, maintaining the natural lumbar lordosis. A drawing-in maneuver has been described by a number of clinicians and researchers whereby the navel is drawn downward toward the spine. “The client is instructed to continue breathing normally while isometrically contracting the abdominal muscles. Once the client is able to isolate the abdominal muscles without performing a pelvic tilt, the exercise is advanced to include arm and/or leg movements while the client continues to maintain a neutral spine position (see figure 1).”

Strengthening of the erector spine muscles may be performed in a variety of positions as well. Initially, strengthening frequency is taught in the prone position, with cueing to engage the abdominal muscles using the drawing in technique. A phenomenon has been described in the literature whereby automatic co-contraction of the multifidi muscles occurs during activation of the transversus abdominis on electromyography analysis. This co-contraction serves to stabilize the spine multidimensionally. Further challenge to the erector spine muscle group can be achieved through arm and/or leg lifts against gravity (see figure 2).

Isolating the erector spine or abdominal muscles is not always indicated in the healthy population. Functional strengthening such as lunges, squats and activities that challenge the balance systems are an excellent option for core strength, spine health and preservation of function. Simply activating the abdominal muscles and maintaining a neutral spine position during functional strength training and cardiovascular exercise can incorporate core strengthening into a variety of exercises and activities to reinforce a healthy spine and waistline.

Bicycling and swimming are both excellent forms of cardiovascular exercise, weight-bearing activity decreases sports-related injury or facilitates muscle performance. Evidence even suggests a temporary decline in muscle activation immediately after stretching. Physiologically, it is thought that the mechanoreceptors activated during stretching actually serve to inhibit motor performance. Despite the controversy surrounding this issue, the bulk of evidence suggests that an active warm-up gradually prepares the body for the activity to be undertaken and is effective in reducing the risk of injury.

Individuals with spine problems should avoid exercise.

MYTH. Unless otherwise indicated by a physician, those with spine problems should continue to exercise. Innomobility leads to muscle atrophy, loss of bone density and limited patient function. Simple cross-training can be taught in the carriageway and intervertebral discs, which are dependent on weight bearing for joint lubrication and nutrition.

After debunking many of the myths associated with exercise, one old saying remains true: “If you don’t use it, you lose it.” Spinal mobility, strength and function are dependent on daily exercise. Pain should always guide the vigor of a workout, and when initiating an exercise program, it is always wise to start cautiously and set attainable goals. A physical therapist can assist with healthy exercise prescription and give advice regarding the exercises most appropriate for each individual.


Stephanie Muzevich, MPT, is clinical supervisor of outpatient therapy at Cleveland Clinic’s Department of Physical Medicine and Rehabilitation. Her interest is outpatient orthopaedic practice with a special interest in the injured worker, wellness and performance artists.

Erin Johnson, DPT, is a senior physical therapist with Cleveland Clinic’s Department of Physical Medicine and Rehabilitation. Her interest is outpatient orthopaedics with a special interest in the injured worker.
Pain and the spine share an intimate relationship: Cervical, thoracic and lumbar pains are generally the primary complaints of individuals with chronic pain. At Cleveland Clinic’s Chronic Pain Rehabilitation Program, the primary complaint of 51 percent of enrolled patients is back pain.

Effective treatment of chronic pain requires an awareness of and attention to psychological factors that influence symptoms. A lack of awareness of the comorbidities of affective disorders and chronic pain can lead to a misunderstanding of the pain cycle and prove to be detrimental to the patient’s recovery. Left unaddressed, anger and other emotions can interfere with rehabilitation and lead to continued pain. Recognition of mood disorders and appropriate referral will improve the outcome of pain treatment.

Pain is perceived as both a somatosensory and an emotional experience. The somatosensory aspect is described as throbbing, achting, sharp, burning, etc. The emotional experience is described with terms such as miserable, unbearable, agonizing and torturing. Up to 55 percent of patients who seek treatment for chronic pain experience symptoms of a mood disorder. Indeed, persistent unmitting pain can have a significant detrimental impact on an individual’s relationships as well as on career functioning. These negative effects can lead to further emotional distress that may go unrecognized and untreated. The additional burden of anger

One of the more prevalent emotions that patients with chronic pain experience is anger, which has been reported in as many as 70 percent of patients with chronic pain. These patients may express anger at themselves, the world, their employer, their spouse, their physician, their lawyer, etc. In other cases, patients with chronic pain acknowledge their anger but choose not to express it. Studies have shown that suppressed feelings of anger account for a significant amount of the variance that exists between patients’ perceptions of pain intensity and the amount of suffering they experience.

Anger at others is associated with a perception of disability due to pain. Anger at oneself appears to be associated with increased depression.

Depression: anger turned inward

Longitudinal studies suggest that depression can contribute to the emergence of chronic pain in selected populations. Epidemiologic studies suggest that depression is twice as prevalent in patients with chronic medical conditions than in those without. Some 73 percent of former professional football players with high depression scores also had high pain scores. The combination of pain and depression is strongly suggestive that a patient will have difficulties with a variety of aspects of everyday life, including personal relationships, physical fitness, sleep and financial dealings.

Left unaddressed, anger and other emotions can interfere with rehabilitation and lead to continued pain.

Awareness of the high prevalence of comorbid depression with chronic pain is imperative because depression can complicate the presentation of the pain, its clinical course and the patient’s response to pain treatment. It appears that the two conditions have a reciprocal influence on each other, and this results in a perpetuation of the pain/depression cycle. This cycle is often overlooked by the medical community for a number of reasons. For example, clinicians tend to prioritize strictly medical diagnoses above emotional or psychiatric diagnoses. Clinicians may also overlook some symptoms of depression (e.g., sleep disturbance, appetite changes and fatigue) because they often overlap those of some medical conditions. In some cases, clinicians may be reluctant to explore depression for fear of stigmatizing or insulting a patient or because they do not know how to handle the problem. Finally, the clinician may be unfamiliar with the pain/depression cycle and the treatment interventions that are available to treat comorbid pain and depression.

Other complications

Pain-related fear and avoidance can significantly contribute to the overall suffering and dysfunction of patients with chronic pain. The anxiety associated with performing activities that incite pain may lead to inactivity and subsequent deconditioning. Fear can lead patients to perceive that their pain is worse than it actually is. Finally, fear can also increase muscle tension, which itself can be painful.

Maladaptive cognitions play a large role in the disability of patients with chronic pain. Understanding the underlying dynamics of chronic pain requires an appreciation of the multiple psychological factors that affect the perception of pain and a patient’s ability to cope with it. Major psychological factors that affect health and rehabilitation include cognitions, behaviors, and patients’ perceptions of how disabled they are. Therefore, the use of cognitive behavioral therapy within a multidisciplinary approach can help identify and correct patients’ maladaptive thoughts and beliefs about themselves and others (cognitive restructuring) and thereby improve their daily functioning. For example, one way to modify a patient’s distorted thoughts about pain is to challenge negative statements such as, “These exercises are breaking my back” or “My life is over because of my neck pain.” Information from the patient’s history, current experience and future expectations can be used to counter these types of distorted thoughts.

Treatment options for pain’s comorbidities

Adjunctive treatments and activities such as biofeedback, deep-breathing exercises, distraction, activity planning and relaxation training are effective ways to reduce stress levels and lessen tense and painful muscles. These techniques help patients regain a sense of self-control and mastery over their symptoms. Finally, group therapy provides patients with an opportunity to identify with others; this may be especially beneficial for patients who feel alone during their recovery.

Epidemiologic studies suggest that depression is twice as prevalent in patients with chronic medical conditions than in those without.
**SLEEP FOR THE SPINE**

Tips to share with patients on how mattresses and sleeping posture affect your spine.

*By Marleen Caldwell, PT, MS, Cred MDT*

**MATTRESS BASICS**

Mattress upholstery is the most expensive aspect of mattress construction. Layers of fabric provide insulation and cushioning between the body and the spring unit. Adding fabrics like wool or silk on top of foam or cotton may feel luxurious, but these layers of padding are more likely to compress and feel like the mattress is sagging long before the springs give out. Foam mattress toppers are an inexpensive alternative that can be easily changed when the foam wears out. One mattress can be used by the entire family, unlike spring mattresses (see figure 3). On an inner-spring mattress, the coils provide support by exerting an equal but opposite force to that imposed on it, which can create pressure points on the occiput, sacrum, scapulae and heels. The disadvantage of foam, however, is that it can make it difficult to turn or get out of bed.

Consider the number of springs in an innerspring mattress. The higher number of coils in a mattress, the more support it will provide and the firmer the mattress will feel. Firmness of the mattress will also be influenced by the gauge of the coils. Heavy-gauge (thick) coils will offer greater support. There is no correct type or number of coils that must be in the mattress; however a mattress that uses too few coils will quickly become lumpy.

**SLEEPING POSITIONS**

Your sleeping posture should maintain the spine in a neutral position. Bed posture can be modified by changing the type of mattress, sleeping position and/or use of pillows.

**Use a pillow.** No matter what position you lie in, a pillow should be used under your head and neck, not under your shoulders. The thickness of the neck pillow should fill in the space between the neck and bed to allow your head to be in a neutral position, as shown in figure 3. Side sleepers should use a thicker pillow than one used by a back sleeper. Side sleepers should also use a second pillow between the knees to maintain alignment of the hips, pelvis and spine (see figure 4).

Body alignment affects the type of support you need. If the hips are wider than the waist, a softer mattress will accommodate the width of the pelvis and allow the spine to maintain neutral. If the hips and waist are relatively straight, a more rigid surface will offer better support (see figure 5).

**Figure 1:** A spring mattress can create pressure points at the occiput, sacrum, scapula and heels and does not provide support to the lumbar or cervical curves.

**Figure 2:** The figure on the left shows the effects to the thoracolumbar curve from habitually sleeping on one side. Top-right, when in the habitual sleeping posture; and bottom-right when in the reverse position.

**Figure 3:** In spine, the pillow needs to fill the space between the neck and bed to maintain neutral alignment of the cervical spine. In side lying, the pillow needs to be thicker and placed under the ear.

**Figure 4:** Notice the alignment of the hip without and then with a pillow between the knees.

**Figure 5:** The figure on top illustrates the pelvic position on a rigid surface compared to the softer surface in the figure below. Notice the left lateral pelvic tilt and lumbar side flexion produced on the rigid surface.

Marleen Caldwell, PT, MS, Cred MDT, is a physical therapist with the Cleveland Clinic Center for Spine Health, specializing on the spine.
Medical Acupuncture for Spinal Pain
By Daniel Mazanec, M.D., and Edwin Capulong, M.D.

Medical acupuncture is a safe procedure performed by a licensed and specially trained physician. Over the past 35 years, the procedure gradually has been accepted as part of a comprehensive approach to wellness in Western society. Although study results were mixed, the National Institutes of Health (NIH) released a consensus paper in 1997 that acupuncture may be a useful adjunctive treatment for back pain as well as other types of pain.

History and basic concepts
Acupuncture originally was described more than two millennia ago in the classic Chinese text The Yellow Emperor’s Classic of Internal Medicine (Huang Di Nei Jing). Although acupuncture has evolved over the past 2,300 years based on treatment responses and varying cultural adaptations, the fundamental basis for the therapy remains centered on the concept of qi (pronounced CHEE).

In the traditional Chinese metaphor, qi is a vital life force that circulates through acupuncture channels called meridians, animating, nourishing and protecting the organism. The flow of qi is balanced in health and disrupted in disease or illness. In Western adaptations, the term energy is most often used as an equivalent to qi. In the traditional model, acupuncture corrects imbalances in qi by stimulating cutaneous points along the meridians. Qi may be tonified or augmented by manual, thermal or electrical stimulation at points along the meridian.

Although Sir William Osler reportedly used acupuncture in 1893, it was not widely used in the United States until it was rediscovered in 1971. At that time, New York Times columnist James Reston, traveling with then-President Nixon, wrote of his successful appendectomy in China with acupuncture anesthesia.

In 1997, the NIH published a consensus statement on acupuncture, concluding that it was a promising treatment for adult postoperative and chemotherapy-induced nausea and vomiting as well as for dental pain. Although study results were inconclusive, the NIH also stated that acupuncture might be a useful adjunctive treatment for myofascial pain, osteoarthritis and back pain.

The science of acupuncture
Although acupuncture’s precise mechanism of action remains uncertain, there is evidence that the procedure has multiple effects that may influence pain perception, both in the central and peripheral nervous systems.

Acupuncture stimulates release of endorphins centrally. In fact, reversal of acupuncture analgesia has been produced with naloxone. Following acupuncture needling, researchers have observed changes in brain functional MRI and PET scans, which is suggestive of a central effect. This may be related to acupuncture’s stimulation of small-diameter nerve fibers, which promote serotonin and norpinephrine release. These changes are consistent with modulation of pain centrally. At the pituitary level, acupuncture stimulates adrenocorticotropic hormone, resulting in increased cortisol production, which has an anti-inflammatory effect.

A gate-control mechanism has been proposed as well. Acupuncture stimulates A-delta fibers entering the dorsal horn of the spinal cord, inhibiting impulses transmitted in slower C-type unmyelinated nerves. Finally, acupuncture needle insertion may generate propagated sensation along the channel, which stimulates release of calcitonin gene-related peptide and acetylcholine. This, in turn, leads to vasodilatation of the tissues.

Medical acupuncture
Medical acupuncture is acupuncture performed by a doctor trained and licensed in Western medicine who also has completed specialty training in acupuncture. Such physicians may use a traditional medicine approach, an acupuncture approach, or a combination of the two as required in the management of pain or illness. Acupuncture has been increasingly incorporated into a comprehensive approach to wellness in Western society, particularly in view of its energetic effects.

Acupuncture for spinal pain
Although acupuncture for spinal pain has been evaluated in many trials, most have been seriously flawed. Double-blind and sham-controlled trials of acupuncture are difficult to design and to perform because acupuncture treatment typically is individualized, making standardization difficult. As a result of these barriers, even attempts at meta-analyses of available data have produced conflicting results. There is some evidence that patients who have positive expectations of acupuncture have superior treatment outcomes. Therefore, the growing use of acupuncture in spinal pain remains based primarily on clinical experience.

More recent studies suggest that acupuncture offers significant clinical benefit to some patients with spinal pain and fibromyalgia in comparison to traditional medical treatment. Similarly, recent trials report acupuncture is effective for the treatment of patients with osteoarthritic knee pain.

Based on these studies and clinical experience to date, acupuncture should be considered as an adjunctive treatment in patients with cervical, thoracic or lumbar pain, whether or not they are experiencing radicular symptoms. The acupuncture approach will vary depending on the duration of the pain, the finding of a significant myofascial component, previous surgical treatment and the presence of comorbid symptoms of fatigue or depression. Chronically opioid-dependent patients appear less responsive to acupuncture.

The acupuncture experience
After an initial consultation, a series of five to 10 weekly or biweekly treatments are performed in an outpatient clinic setting. A typical visit may last between 30 and 60 minutes. Treatment is individualized as well as modified based on the clinical response. Depending on the duration of symptoms and clinical findings, treatment may include deactivation of trigger points, local needling of regional acupuncture points, punctaneous electrical nerve stimulation, osteopuncture and activation of meridian circuits with or without electrical stimulation. Commonly, a local treatment is performed at the pain site in combination with a more general energetic meridian treatment.

Acupuncture needles are sterile, steel, solid and individually wrapped for single-use only. With insertion at a meridian point, a deep aching sensation is sought with insertion. Commonly, a local treatment is performed at the pain site in combination with a more general energetic meridian treatment.
Acupuncture is generally a safe procedure. Serious adverse events are rare but include pneumothorax or other organ or vascular puncture injury. With the use of disposable sterile needles, risk of serious infection is virtually nil. In patients taking anticoagulant agents, injection and acupuncture for spine disorders.

By Paula Lidestri, M.D.

Neck and low back pain are two of the most common medical problems affecting modern society; approximately 75 to 80 percent of the population experiences an episode of one or the other at some point in their life. Although most episodes resolve spontaneously, approximately 10 percent of patients will go on to suffer from chronic pain.

It is this sector that consumes a disproportionate amount of healthcare resources and frequently falls prey to the multitude of often-dubious healthcare schemes promising miracle cures. Although no such miracles exist, it does beg the question as to whether diet and nutrition can alter outcomes in neck and back pain and prevent unnecessary suffering.

The spine is composed of various structural entities (bones, discs, joints, ligaments, nerves and muscles) that have the potential to undergo injury, degenerate and trigger the pain cycle. Keeping this in mind is important in understanding how diet may impact neck and back pain.

**Diet and nutrition**

**BACK PAIN DIET**. One popular concept for back pain relief is the back pain diet. This diet is based on the premise that all structures of the spine require proper nutrition to function maximally. As such, a well-balanced diet composed of healthful foods is crucial to maintaining a healthy back. For instance, protein from lean meats, fish and dairy products, is important in meat, eggs and dairy products, is important for nervous system function. Calcium, vitamin D (cholecalciferol) and magnesium are all important for bone health. Vitamin D deficiency has been linked to chronic muscle pain. A University of Minnesota study of 150 patients with chronic musculoskeletal pain found that 93 percent had vitamin D deficiency. A University of Minnesota study of 150 patients with chronic musculoskeletal pain found that 93 percent had vitamin D deficiency.

**ANTI-INFLAMMATORY DIET**. Another popular concept is the anti-inflammatory diet. Its premise is that a derangement in the inflammatory process is responsible for certain disease processes and that certain foods have anti-inflammatory properties while others have pro-inflammatory properties. For instance, the omega-6 essential fatty acids (EFAs) linoleic acid [found in cooking oils and processed foods] and arachidonic acid (AA) [ingested directly from meats] are thought to promote inflammation by means of linoleic acid being broken down to AA and both feeding into the inflammatory cycle.

In contrast, gamma-linolenic acid (GLA), a third member of the omega-6 family found primarily in plant-based oils, may actually reduce inflammation because much of GLA is not converted to AA. Instead, it is converted to dihomogamma-linolenic acid (DGLA), which competes with AA. Certain nutrients, including magnesium, zinc and vitamins C, B₁₂, and B₆, help to promote the conversion of GLA to DGLA.

Omega-3 EFAs also are thought to have significant anti-inflammatory effects. In a study conducted at the University of Pittsburgh, omega-3 EFAs taken at 1,200 to 2,400 mg daily were found to have equal pain-relieving effects as prescription nonsteroidal anti-inflammatory drugs (NSAIDS), but without the significant side effects.

What also seems to be important is the ratio of omega-6 EFAs to omega-3 EFAs. A healthy diet should consist of roughly two to four times more omega-6 fatty acids than omega-3 fatty acids. Refined sugar, simple carbohydrates and other foods with high glycemic values increase insulin levels. In turn, higher insulin levels increase free radicals and skew eicosanoids (which can be either pro- or anti-inflammatory compounds) toward the pro-inflammatory cycle.

Inflammation is often assumed to be the culprit in acute and chronic back pain syndromes, and treatment is directed towards reducing inflammation with medications such as NSAIDs and steroids. The anti-inflammatory diet promotes eating certain foods that naturally inhibit the inflammatory cascade, thereby decreasing pain. Unfortunately, modern-day fat pho-
Sources of Omega-3 EFAs
- Canola oil
- Wheat germ
- Soybeans
- Hops seeds
- Flaxseeds
- Cold-water oily fish (salmon)
- Walnuts
- Hempseeds
- Soybeans

Sources of Vitamin D, Calcium and Magnesium
- Salmon: fish with small bones, salmon fish oil, fortified milk and cereal, exposure to sunlight
- Calcium: dairy products, leafy greens
- Magnesium: green vegetables, legumes, nuts and whole grains

**Dietary Sources of Fat**

**Good** (Monounsaturated Fats):
- Most nuts, peanut oil, olive oil, canola oil, safflower oil, sunflower oil, corn oil, soybean oil, cottonseed oil, grapeseed oil, walnut oil, flaxseed oil, rice bran oil

**Bad** Fats:
- Saturated: lard, coconut and palm oils, meat, eggs, butter, dairy products
- Hydrogenated (Trans fatty acids): margarine, fast foods (vegetable shortening)

**GLUCOSAMINE AND CHONDROITIN SULFATE.** These dietary supplements are commonly used to treat pain associated with arthritic conditions; however, their use is becoming increasingly more popular in those who suffer from back pain. These supplements are being touted by many for not only their ability to affect cartilage metabolism, but also for their anti-inflammatory properties. The Glucosamine/Chondroitin Arthritis Intervention Trial (GAIT) was aimed at evaluating the efficacy of glucosamine, chondroitin sulfate and the two in combination. It revealed that the combination may be effective in a sub-group of patients with moderate to severe pain.

**Herbal supplements**

Herbal remedies have been used in Eastern society for centuries and have become increasingly more popular in Western society over the past few decades. An estimated one-third of the American population uses at least one herbal therapy, spending an estimated $13.7 billion annually.

Herbal supplements are not FDA-regulated, and there is no real way for the agency’s potential to do so. A number of studies that have analyzed various herbal products discovered not only a wide variation in the amount of active ingredients, but also toxic contaminants such as lead and arsenic. The wide variable in active ingredients and lack of standardization makes studying these products quite difficult. Furthermore, manufacturer’s advertisements of these supplements often boast cures for ailments and for back pain in particular; however, quality studies to support these claims are lacking.

Nevertheless, considering the widespread use of these products, it is important to be familiar with at least the more popular supplements used by those with neck and back pain.

**THUNDER GOD VINE** is a plant that has been used medicinally in China for more than 400 years. The proposed mechanism is the down-regulation of tumor necrosis factor-alpha genes, reduced B and T cell activity, and inhibition of cyclooxygenase 2 induction. The extraction process is critically important because it transforms the otherwise toxic substance into a therapeutic treatment. The chloroform/methanol extract of this plant (T2) was shown to reduce pain and inflammation in a small group of people in a randomized, double-blind, placebo-controlled study published in the July 2002 issue of *Arthritis & Rheumatism.* Despite the potential usefulness of T2, multiple adverse side effects have been reported, including GI disturbances, amnesia, kidney dysfunction, leukopenia, thrombocytopenia and aplastic anemia.

**DEVIL’S CURVE,** named from the small hooks on the plant’s fruit, is native to southern Africa. The plant’s active ingredients are thought to be iridoid glycosides called harpagosides, which are located in the root. While it is often used to enhance digestion because the bitter taste is thought to stimulate digestive juices, the primary use of devil’s claw is for conditions that cause inflammation and pain.

**EVENING PRIMROSE** is a biennial North American plant found east of the Rocky Mountains to the Atlantic Ocean. Once a staple food of many Native American tribes, the seeds of evening primrose contain a variety of amino acids and oils, including linoleic acid, oleic acid, palmitic acid, stearic acid and gamma-linolenic acid (GLA). The medicinal action revolves around the omega-6 essential fatty acids (linoleic acid and GLA) as well as its relationship with prostaglandin synthesis. GLA is believed to have anti-inflammatory and antithrombotic actions. To date, study results have been mixed, and most studies have been small and poorly designed. However, one study found that, after 12 months, patients who took either 540 mg/d primrose oil or 450 mg/d GLA had reduced pain and were able to decrease their use of NSAIDs.

**BORAGE** is an annual herb native to Central and Eastern Europe that is rich in minerals, especially potassium. The oil extracted from the seeds is marketed as starflower oil or borage oil and is a good source of GLA. The medicinal effects of borage are related to the anti-inflammatory actions of GLA.

**WILLOW BARK,** used medicinally, can be traced to 400 BC, when it was recommended to patients that they chew on the bark to curtail fever and inflammation. Used throughout the centuries in Europe and China, willow bark continues to be used for the treatment of pain, particularly low back pain and osteoarthritis. It is also used for headache pain and inflammatory conditions such as tendinitis and bursitis. Willow bark sold in the United States generally is comprised of a combination of bark from white, purple and crack willows. Salicin, contained in the bark of the white willow, is chemically similar to acetylsalicylic acid (aspirin), which may explain the pain-relieving and anti-inflammatory effects of the herb. In a study of almost 200 patients with low back pain, those who received willow bark experienced a significant improvement in pain compared with those who received a placebo. Furthermore, patients who received higher doses of willow bark (240 mg salicin) had more significant pain relief than those who received lower doses (120 mg salicin).

**CAPSAICIN CREAM** derives its active ingredient from chili peppers, and is sold as a skin cream to relieve pain. It depletes a pain-transmitting neuropeptide from the skin called substance P, which results in an analgesic effect. In one double-blind study, 160 subjects were treated with capsaicin while another 160 subjects used a placebo. After three weeks of treatment, pain was reduced by 41 percent in the capsaicin group compared with 31 percent in the placebo group. A typical dosage of capsaicin cream is 0.025 percent applied four times daily. The most common side effect is a stinging or burning sensation in the area it is applied.

**PHYTODOHOSOM** is a standardized herbal preparation that contains extracts of Populus tremula, Fraxinus excelsior and Solidago virgaurea in a 3:1:1 ratio. Used for the management of musculoskeletal pain because of its anti-inflammatory properties, Phytodohosom is believed to interfere with arachidonic acid metabolism by way of the cyclooxygenase and lipoygenase pathways.

**AVACADO/SOYBEAN UNSAPONIFIABLES (ASU)** are extracts derived from one-third avocado oil and two-thirds soybean oil after hydrolysis; however, the chemical names and structures are not specifically known. Four randomized double-blind trials compared ASU (primarily 300 mg once daily) with placebo in the treatment of a total of 751 patients with hip or knee osteoarthritis. All patients had at least moderate pain and were using NSAIDs for pain control. Three of the four trials showed that ASU reduces pain and NSAID use.
Feverfew’s name stems from the Latin word febrifugia, which means fever reducer. Its active compound parthenolide inhibits serotonin release from aggregating platelets, and blocks phospholipases, which prohibits the release of arachadonic acid. It has not been found to inhibit cyclooxygenase. Potential side effects of feverfew include aphthous ulcers, irritable bowel syndrome and rebound headaches from abrupt cessation.

Valerian commonly is used as an anti spasmodic agent and mild anxiolytic. Theoretically, it causes release of gamma-aminobutyric acid. There have been anecdotal reports of hepatotoxicity and cardiac symptoms in those with pre-existing hypertension, coronary artery disease and congestive heart failure.

Paula Lidestri, M.D., is a physical medicine and rehabilitation specialist with a subspecialty in medical/interventional spine at the Cleveland Clinic Center for Spine Health. She specializes in the evaluation and non-operative treatment of neck and back pain, general musculoskeletal disorders, spine wellness and interventional spine techniques.

Prospective outcomes evaluation of decompression with or without instrumented fusion for lumbar stenosis with degenerative grade 1 spondylothesis
Edward Benzel, M.D. 216.445.5514

Comparing surgical to conservative management in the treatment of Type II odontoid fractures among the elderly
Edward Benzel, M.D. 216.445.5514

Prospective, randomized clinical investigation of the Cervitech, Inc., Porous Coated Motion Artificial Disc for stabilization of the cervical spine in patients with ODI and neurological symptoms at one level (C3-C4 or 7-T1)
Richard Schmick, M.D. 216.445.4539
Isador Lieberman, M.D. 216.445.2743

The prediction of pain reduction in the treatment of facet joint syndrome monitored by CERS® technology
Daniel Mazanec, M.D. 216.444.6191

Anterior cervical fusion augmented with autologous marrow: a controlled, prospective, randomized trial
Robert McLain, M.D. 216.444.2744

Pilot study assessing the use of Cortoss, a synthetic cortical bone void filler in kyphoplasty
Isador Lieberman, M.D. 216.445.2743

Applying support for patients with coccycodynia
Gaurav Kapoor, M.D. 216.445.7378

Comparison of fenoral ring allotropy with supplemental transaminar facet screw fixation vs. stand-alone anterior lumbar interbody fusion cages
Douglas Orr, M.D. 216.363.2410

An assessment of surgical techniques for treating cervical spondylotic myelopathy
Thomas Mozzi, M.D. 216.445.9232

Randomized, control trial of Duragen plus adhesion barrier matrix to minimize adhesions following lumbar discectomy
Edward Benzel, M.D. 216.445.5514

An assessment of P-15 bone putty in anterior cervical fusion with instrumentation
Iain Kalfas, M.D. 216.444.9064

OP-1 putty
Michael Steinmetz, M.D. 216.445.4833

A prospective, multicenter, randomized controlled study to compare the spinal sealant as an adjunct to solved dural repair with standard of care methods during spinal surgery
Ajit Krishnay, M.D. 216.445.3777

Edward Benzel, M.D.
Primary Appointment: Cleveland Clinic Center for Spine Health
Clinical Interests: Spine biomechanics, cervical spondylomatosis, spinal stenosis
Office: 216.445.5514
Joint Appointment: Neurosurgery

Edith C. Covington, M.D.
Primary Appointment: Cleveland Clinic Center for Spine Health
Clinical Interests: Back pain in adults and adolescents, non-invasive treatment of back pain
Office: 216.444.5964

Iain Kalfas, M.D.
Primary Appointment: Cleveland Clinic Center for Spine Health
Clinical Interests: Cervical spine, arm pain, spine trauma
Office: 216.445.8080

William W. Buehler, M.D.
Primary Appointment: Cleveland Clinic Center for Spine Health
Clinical Interests: Spinal deformity, spinal trauma, spinal tumors, scoliosis, spinal cord injury
Office: 216.445.9232

Frederick Firestone, M.D.
Primary Appointment: Cleveland Clinic Center for Spine Health
Clinical Interests: Spinal cord injury, spinal trauma, spinal tumors, scoliosis
Office: 216.445.2006

To refer a patient to the Cleveland Clinic Center for Spine Health, call 216.444.BACK.
Visit us online at clevelandclinic.org/spine.
Sourav Kapil, M.D.
Clinical Interests: Non-surgical management of the spine, lumbar discectomy, lumbar fusion, thoracic disc herniation, and non-surgical management of low back pain and neck pain.
Office: 216.445.7070
Joint Appointment: Rehabilitation Medicine

Kurt Kranefuss, M.D.
Clinical Interests: Degenerative disease of the spine, lumbar disc and foraminal stenosis, lumbar and cervical spondylosis, lumbar and cervical spondylolisthesis, and microdiscectomy.
Office: 216.444.2740
Joint Appointment: Orthopaedic Surgery

Asha B. Nigam, M.D.
Clinical Interests: Medical management of back and neck pain, chronic pain, spinal cord injury, and spinal stenosis.
Office: 216.444.2873
Joint Appointment: Pain Management

Anita Verma, B.D.S.
Clinical Interests: Oral and Maxillofacial Surgery, Endodontics, Periodontics, Oral Medicine, Oral Pathology, and Orofacial Pain.
Office: 216.444.2819
Joint Appointment: Oral and Maxillofacial Surgery

Evan R. Neff, M.D.
Clinical Interests: Vascular medicine, interventional radiology, hyperlipidemia, and management of cardiovascular and metabolic diseases.
Office: 216.444.2655
Primary Appointment: Cardiovascular Medicine

Santhosh Thomas, D.O.
Clinical Interests: General medicine, internal medicine, and respiratory medicine.
Office: 216.445.3243
Primary Appointment: Primary Care Medicine

Thomas Milk, M.D.
Clinical Interests: Minimally invasive spinal surgery, complex cervical spine surgery, complex anterior, posterior, and lateral approaches, and spinal deformity surgery.
Office: 216.445.8327
Joint Appointment: Neurosurgery, Orthopaedic Surgery

R. Douglas Do, M.D.
Clinical Interests: Spine surgery, spinal disorders, spine-in-motion, and percutaneous interventional spine surgery.
Office: 216.445.2743
Joint Appointment: Orthopaedic Surgery

Frederick Mihalos, D.O.
Clinical Interests: Treatment of low back and neck pain, evaluation of therapies.
Office: 440.445.8204
Joint Appointment: Family Medicine

Santhosh Thomas, D.O.
Clinical Interests: Cardiovascular medicine, pain medicine, neurology, and respiratory medicine.
Office: 216.445.3243
Primary Appointment: Primary Care Medicine

Serkan Inceoglu, Ph.D.
Research Interests: Biomechanics, Nanotechnology, and Biotechnology.
Office: 216.445.2368
Joint Appointment: Spine Research and Technology Laboratory

Lars Gilbertson, Ph.D.
Research Interests: Biomechanics, Nanotechnology, and Biotechnology.
Office: 216.445.5061
Joint Appointment: Spine Research and Technology Laboratory

Adrian Zuckerman, M.D., M.F.A.
Clinical Interests: Biometric data, spine surgery, and spinal cord injuries.
Office: 216.444.2873
Primary Appointment: Orthopaedic Surgery

Santhosh Thomas, D.O.
Clinical Interests: Cardiovascular medicine, pain medicine, neurology, and respiratory medicine.
Office: 216.445.3243
Primary Appointment: Primary Care Medicine

J. Michael Meredith, M.D.
Clinical Interests: General medicine, internal medicine, and respiratory medicine.
Office: 216.445.3243
Primary Appointment: Primary Care Medicine

Jane F. Nelson, M.D.
Clinical Interests: Pain medicine, neurology, and respiratory medicine.
Office: 216.445.3243
Primary Appointment: Primary Care Medicine

Richard Schlenk, M.D.
Clinical Interests: Pain medicine, neurology, and respiratory medicine.
Office: 216.445.3243
Primary Appointment: Primary Care Medicine

Judith Scheman, Ph.D.
Clinical Interests: Spinal cord injury, spinal cord disease, spinal stenosis, and spinal deformity.
Office: 216.445.2368
Primary Appointment: Neurology

Santhosh Thomas, D.O.
Clinical Interests: Cardiovascular medicine, pain medicine, neurology, and respiratory medicine.
Office: 216.445.3243
Primary Appointment: Primary Care Medicine

Mitchel E. Niznik, M.D.
Clinical Interests: Pain medicine, neurology, and respiratory medicine.
Office: 216.445.3243
Primary Appointment: Primary Care Medicine

Santhosh Thomas, D.O.
Clinical Interests: Cardiovascular medicine, pain medicine, neurology, and respiratory medicine.
Office: 216.445.3243
Primary Appointment: Primary Care Medicine

Lars Gilbertson, Ph.D.
Research Interests: Biomechanics, Nanotechnology, and Biotechnology.
Office: 216.445.5061
Joint Appointment: Spine Research and Technology Laboratory

Samuel Benjamin, Ph.D.
Research Interests: Spinal cord injury, spinal cord disease, and spinal cord repair.
Office: 216.445.3243
Primary Appointment: Physical Medicine and Rehabilitation

Brian Hoy, Ph.D.
Research Interests: Spinal cord injury, spinal cord disease, and spinal cord repair.
Office: 216.445.3243
Primary Appointment: Physical Medicine and Rehabilitation

Christian Burg, D.O.
Clinical Interests: Spinal cord injury, spinal cord disease, and spinal cord repair.
Office: 216.445.3243
Primary Appointment: Physical Medicine and Rehabilitation

J. Michael Meredith, M.D.
Clinical Interests: General medicine, internal medicine, and respiratory medicine.
Office: 216.445.3243
Primary Appointment: Primary Care Medicine

Santhosh Thomas, D.O.
Clinical Interests: Cardiovascular medicine, pain medicine, neurology, and respiratory medicine.
Office: 216.445.3243
Primary Appointment: Primary Care Medicine
Dr. Connect

ONLINE ACCESS TO YOUR PATIENT’S MEDICAL RECORD

Whether you are referring from near or far, our new eCleveland Clinic service, Dr.Connect, can streamline your communication with our specialists. This new online tool offers you secure access to your patient’s Cleveland Clinic medical record. You can track your patient’s care in real time, without additional software or hardware other than an Internet connection. To establish a Dr.Connect account, please call 877.224.7367 or e-mail drconnect@ccf.org.