

H A N D O U T O N H E A L T H

Recognizing
The National
Bone and Joint Decade
2002–2011

Back Pain

**U.S. Department of Health and
Human Services
National Institutes of Health
National Institute of Arthritis and
Musculoskeletal and Skin Diseases**

For Your Information

This publication contains information about medications used to treat the health condition discussed in this booklet. When this booklet was printed, we included the most up-to-date (accurate) information available. Occasionally, new information on medication is released.

For updates and for any questions about any medications you are taking, please contact the U.S. Food and Drug Administration at 1-888-INFO-FDA (1-888-463-6332, a toll-free call) or visit their Web site at www.fda.gov.

This booklet is not copyrighted. Readers are encouraged to duplicate and distribute as many copies as needed.

Additional copies of this booklet are available from the National Institute of Arthritis and Musculoskeletal and Skin Diseases, NIAMS/National Institutes of Health, 1 AMS Circle, Bethesda, MD 20892-3675, and on the NIAMS Web site at www.niams.nih.gov/hi/topics/

Contents

What Is Back Pain?	1
How Common Is It?	1
What Are the Risk Factors for Back Pain?	2
What Are the Causes of Back Pain?	5
Can Back Pain Be Prevented?	7
When Should I See a Doctor for Pain?	8
Which Type of Doctor Should I See?	8
How Is Back Pain Diagnosed?	9
What Is the Difference Between Acute and Chronic Pain?	12
How Is Back Pain Treated?	12
Nonoperative treatments	13
Operative treatments	23
What Kind of Research Is Being Done?	29
For More Information	33
Glossary	35

Illustrations

Side View of Spine	2
Normal Vertebra (Cross Section)	3



Back Pain

This booklet is for people who have back pain, as well as family members, friends, and others who want to find out more about it. The booklet describes causes, diagnosis, and treatments, and research efforts to learn more about it, many of which are supported by the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) and other components of the Department of Health and Human Services' National Institutes of Health (NIH). If you have further questions after reading this booklet, you may wish to discuss them with your doctor.

What Is Back Pain?

Back pain is an all-too-familiar problem that can range from a dull, constant ache to a sudden, sharp pain that leaves you incapacitated. It can come on suddenly – from an accident, a fall, or lifting something too heavy – or it can develop slowly, perhaps as the result of age-related changes to the spine. Regardless of how it happens or how it feels, you know it when you have it. And chances are, if you don't have it now, you will eventually.

How Common Is It?

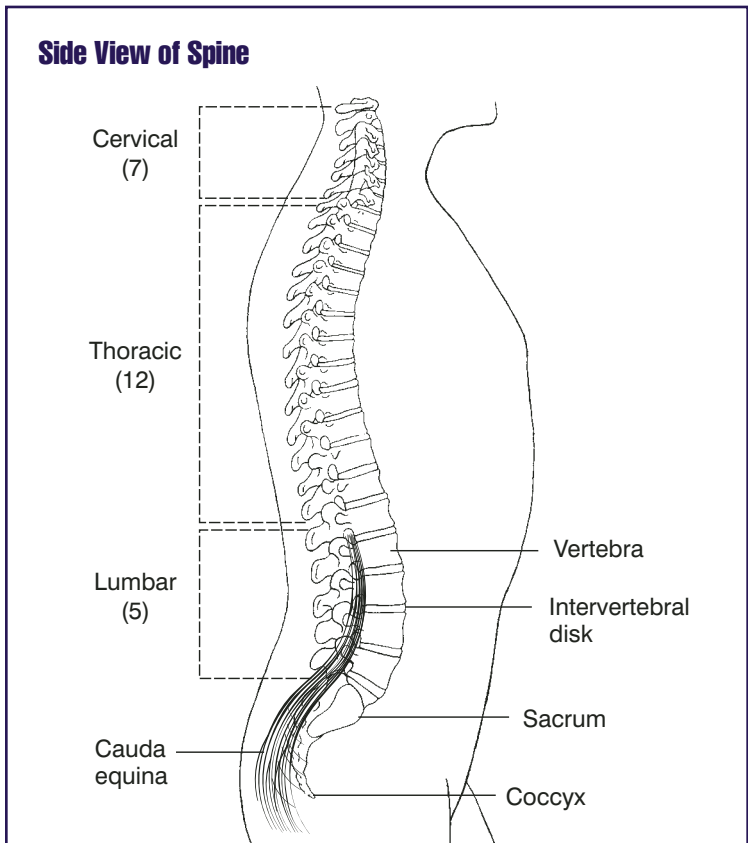
At some point, back pain affects an estimated 8 out of 10 people. It is one of our society's most common medical problems.

What Are the Risk Factors for Back Pain?

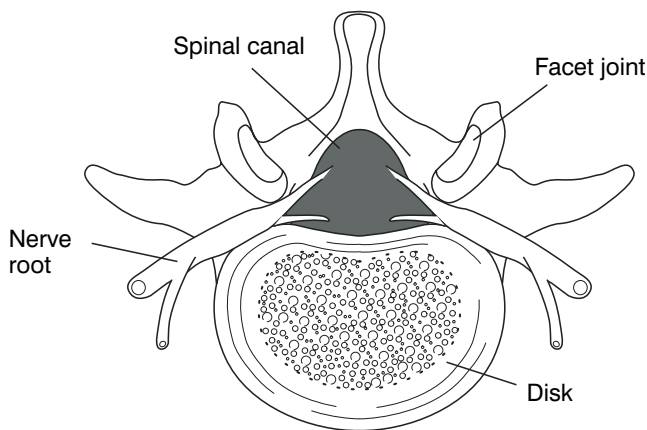
Although anyone can have back pain, a number of factors increase your risk. They include:

Age: The first attack of low back pain typically occurs between the ages of 30 and 40. Back pain becomes more common with age.

Fitness level: Back pain is more common among people who are not physically fit. Weak back and abdominal muscles may not properly support the spine. “Weekend



Normal Vertebra (Cross Section)



warriors” – people who go out and exercise a lot after being inactive all week – are more likely to suffer painful back injuries than people who make moderate physical activity a daily habit. Studies show that low-impact aerobic exercise is good for the discs that cushion the vertebrae, the individual bones that make up the spine.

Diet: A diet high in calories and fat, combined with an inactive lifestyle, can lead to obesity, which can put stress on the back.

Heredity: Some causes of back pain, including disc disease, may have a genetic component.

Race: Race can be a factor in back problems. African American women, for example, are two to three times more likely than white women to develop spondylolisthesis, a condition in which a vertebra of the lower spine – also called the lumbar spine – slips out of place.

The presence of other diseases: Many diseases can cause or contribute to back pain. These include various forms of arthritis, such as osteoarthritis, rheumatoid arthritis, and ankylosing spondylitis, and cancers elsewhere in the body that may spread to the spine.

Occupational risk factors: Having a job that requires heavy lifting, pushing, or pulling, particularly when this involves twisting or vibrating the spine, can lead to injury and back pain. An inactive job or a desk job may also lead to or contribute to pain, especially if you have poor posture or sit all day in an uncomfortable chair.

Cigarette smoking: Although smoking may not directly cause back pain, it increases your risk of developing low back pain and low back pain with sciatica. (Sciatica is back pain that radiates to the hip and/or leg due to pressure on a nerve.) For example, smoking may lead to pain by blocking your body's ability to deliver nutrients to the discs of the lower back. Or, repeated coughing due to heavy smoking may cause back pain. It is also possible that smokers are just less physically fit or less healthy than nonsmokers, which increases the likelihood that they will develop back pain. Furthermore, smoking can slow healing, prolonging pain for people who have had back injuries, back surgery, or broken bones.

What Are the Causes of Back Pain?

It is important to understand that back pain is a symptom of a medical condition, not a diagnosis itself. Medical problems that can cause back pain include the following:

Mechanical problems: A mechanical problem is a problem with the way your spine moves or the way you feel when you move your spine in certain ways. Perhaps the most common mechanical cause of back pain is a condition called intervertebral disc degeneration, which simply means that the discs located between the vertebrae of the spine are breaking down with age. As they deteriorate, they lose their cushioning ability. This problem can lead to pain if the back is stressed. Other mechanical causes of back pain include spasms, muscle tension, and ruptured discs, which are also called herniated discs.

Injuries: Spine injuries such as sprains and fractures can cause either short-lived or chronic pain. Sprains are tears in the ligaments that support the spine, and they can occur from twisting or lifting improperly. Fractured vertebrae are often the result of osteoporosis, a condition that causes weak, porous bones. Less commonly, back pain may be caused by more severe injuries that result from accidents and falls.

**It is important
to understand
that back pain
is a symptom
of a medical
condition,
not a diagnosis
itself.**

Acquired conditions and diseases: Many medical problems can cause or contribute to back pain. They include scoliosis, which causes curvature of the spine and does not usually cause pain until mid-life; spondylolisthesis; various forms of arthritis, including osteoarthritis, rheumatoid arthritis, and ankylosing spondylitis; and spinal stenosis, a narrowing of the spinal column that puts pressure on the spinal cord and nerves. While osteoporosis itself is not painful, it can lead to painful fractures of the vertebrae. Other causes of back pain include pregnancy; kidney stones or infections; endometriosis, which is the buildup of uterine tissue in places outside the uterus; and fibromyalgia, which causes fatigue and widespread muscle pain.

Infections and tumors: Although they are not common causes of back pain, infections can cause pain when they involve the vertebrae, a condition called osteomyelitis, or when they involve the discs that cushion the vertebrae, which is called discitis. Tumors, too, are relatively rare causes of back pain. Occasionally, tumors begin in the back, but more often they appear in the back as a result of cancer that has spread from elsewhere in the body.

Although the causes of back pain are usually physical, it is important to know that emotional stress can play a role in how severe pain is and how long it lasts. Stress can affect the body in many ways, including causing back muscles to become tense and painful.

Can Back Pain Be Prevented?

One of the best things you can do to prevent back pain is to exercise regularly and keep your back muscles strong. Four specific types of exercises are described in *How Is Back Pain Treated?* (page 12). All may help you avoid injury and pain. Exercises that increase balance and strength can decrease your risk of falling and injuring your back or breaking bones. Exercises such as Tai Chi and yoga – or any weight-bearing exercise that challenges your balance – are good ones to try.

Eating a healthy diet also is important. For one thing, eating to maintain a healthy weight – or to lose weight, if you are overweight – helps you avoid putting unnecessary and injury-causing stress and strain on your back. To keep your spine strong, as with all bones, you need to get enough calcium and vitamin D every day. These nutrients help prevent osteoporosis, which is responsible for a lot of the bone fractures that lead to back pain. Calcium is found in dairy products; green, leafy vegetables; and fortified products, like orange juice. Your skin makes vitamin D when you are in the sun. If you are not outside much, you can obtain vitamin D from your diet: almost all milk and some other foods are fortified with this nutrient. Most adults don't get enough calcium and vitamin D, so talk to your doctor about how much you need per day, and consider taking a nutritional supplement or a multivitamin.

Practicing good posture, supporting your back properly, and avoiding heavy lifting when you can may all help you prevent injury. If you do lift something heavy, keep your back straight. Don't bend over the item; instead, lift it by putting the stress on your legs and hips.

When Should I See a Doctor for Pain?

In most cases, it is not necessary to see a doctor for back pain because pain usually goes away with or without treatment. However, a trip to the doctor is probably a good idea if you have numbness or tingling, if your pain is severe and doesn't improve with medications and rest, or if you have pain after a fall or an injury. It is also important to see your doctor if you have pain along with any of the following problems: trouble urinating; weakness, pain, or numbness in your legs; fever; or unintentional weight loss. Such symptoms could signal a serious problem that requires treatment soon.

Which Type of Doctor Should I See?

Many different types of doctors treat back pain, from family physicians to doctors who specialize in disorders of the nerves and musculoskeletal system. In most cases, it is best to see your primary care physician first. In many cases, he or she can treat the problem. In other cases, your doctor may refer you to an appropriate specialist.

How Is Back Pain Diagnosed?

Diagnosing the cause of back pain requires a medical history and a physical exam. If necessary, your doctor may also order medical tests, which may include x rays.

During the medical history, your doctor will ask questions about the nature of your pain and about any health problems you and close family members have or have had.

Questions might include the following:

- Have you fallen or injured your back recently?
- Does your back feel better – or hurt worse – when you lie down?
- Are there any activities or positions that ease or aggravate pain?
- Is your pain worse or better at a certain time of day?
- Do you or any family members have arthritis or other diseases that might affect the spine?
- Have you had back surgery or back pain before?
- Do you have pain, numbness and/or tingling down one or both legs?

During the physical exam, your doctor may

- watch you stand and walk
- check your reflexes to look for slowed or heightened reflexes, either of which might suggest nerve problems
- check for fibromyalgia by examining your back for tender points, which are points on the body that are painful when pressure is applied to them
- check for muscle strength and sensation
- check for signs of nerve root irritation.

Often a doctor can find the cause of your pain with a physical and medical history alone. However, depending on what the history and exam show, your doctor may order medical tests to help find the cause.

Following are some tests your doctor may order:

X rays: Traditional x rays use low levels of radiation to project a picture onto a piece of film (some newer x rays use electronic imaging techniques). They are often used to view the bones and bony structures in the body. Your doctor may order an x ray if he or she suspects that you have a fracture or osteoarthritis, or that your spine is not aligned properly.

Magnetic Resonance Imaging (MRI): MRI uses a strong magnetic force instead of radiation to create an image. Unlike an x ray, which shows only bony structures, an MRI scan produces clear pictures of soft tissues, too,

**Diagnosing
the cause of
back pain
requires a
medical history
and physical exam.**

such as ligaments, tendons, and blood vessels. Your doctor may order an MRI scan if he or she suspects a problem such as an infection, tumor, inflammation, or pressure on a nerve. An MRI scan, in most instances, is *not* necessary during the early phases of low back pain unless your doctor identifies certain “red flags” in your history and physical exam. An MRI scan is needed if the pain persists more than 3–6 weeks, or if your doctor feels there may be a need for surgical consultation. Because most low back pain goes away on its own, getting an MRI scan too early may sometimes create confusion for the patient and the doctor.

Computed Tomography (CT) scan: A CT scan allows your doctor to see spinal structures that cannot be seen on traditional x rays. It is a three-dimensional image that a computer creates from a series of two-dimensional pictures that it takes of your back. Your doctor may order a CT scan to look for problems including herniated discs, tumors, or spinal stenosis.

Blood tests: Although blood tests are not used generally in diagnosing the cause of back pain, your doctor may order them in some cases. Blood tests that might be used include the following:

- **Complete blood count (CBC)**, which could point to problems such as infection or inflammation
- **Erythrocyte sedimentation rate (also called *sed rate*)**, a measure of inflammation that may suggest infection. The presence of inflammation may also suggest some forms of arthritis or, in rare cases, a tumor.

It is important to understand that medical tests alone may not diagnose the cause of back pain. In fact, experts say that up to 90 percent of *all* MRI scans of the spine show some type of abnormality, and sometimes the x rays and CT scans of people without pain show problems. Similarly, even some healthy pain-free people can have elevated sed rates.

Only with a medical history and exam – and sometimes medical tests – can a doctor diagnose the cause of back pain. Many times, the precise cause of back pain is never known. In these cases, it may be comforting to know that most back pain gets better whether or not you find out what is causing it.

What Is the Difference Between Acute and Chronic Pain?

Pain that hits you suddenly – after falling from a ladder, being tackled on the football field, or lifting a load that is just too heavy, for example – is acute pain. Acute pain comes on quickly and often leaves just as quickly. To be classified as acute, pain should last no longer than 6 weeks. Acute pain is the most common type of back pain.

Chronic pain, on the other hand, may come on either quickly or slowly, and it lingers a long time. In general, pain that lasts more than 3 months is considered chronic. Chronic pain is much less common than acute pain.

How Is Back Pain Treated?

Treatment for back pain generally depends on what kind of pain you experience: acute or chronic.

Acute Back Pain

Acute back pain usually gets better on its own and without treatment, although you may want to try acetaminophen, aspirin, or ibuprofen to help ease the pain. Perhaps the best advice is to go about your usual activities as much as you can with the assurance that the problem will clear up. Getting up and moving around can help ease stiffness, relieve pain, and have you back doing your regular activities sooner. *Exercises are not usually advisable for acute back pain, nor is surgery.*

Chronic Back Pain

Treatment for chronic back pain falls into two basic categories: the kind that requires an operation and the kind that does not. In the vast majority of cases, back pain does not require surgery.

Doctors will almost always try nonsurgical treatments before recommending surgery. In a very small percentage of cases – when back pain is caused by a tumor, an infection, or a nerve root problem called cauda equina syndrome, for example – prompt surgery is necessary to ease the pain and prevent further problems.

Following are some of the more commonly used treatments for chronic back pain.

Nonoperative treatments

Hot or cold: Hot or cold packs – or sometimes a combination of the two – can be soothing to chronically sore, stiff backs. Heat dilates the blood vessels, improving the supply of oxygen that the blood takes to the back and reducing muscle spasms. Heat also alters the sensation of pain. Cold may reduce inflammation by decreasing the size of blood vessels and the flow of blood to the area. Although cold may feel painful against the skin, it numbs deep pain. Applying heat or cold may relieve pain, but it does not cure the cause of chronic back pain.

Getting up and moving around can help ease stiffness, relieve pain, and have you back doing your regular activities sooner.

Exercise: Although exercise is usually not advisable for acute back pain, proper exercise can help ease chronic pain and perhaps reduce its risk of returning. The following four types of exercise are important to general physical fitness and may be helpful for certain specific causes of back pain:

Flexion: The purposes of flexion exercises, which are exercises in which you bend forward, are to 1) widen the spaces between the vertebrae, thereby reducing pressure on the nerves; 2) stretch muscles of the back and hips; and 3) strengthen abdominal and buttock muscles. Many doctors think that strengthening the muscles of the abdomen will reduce the load on the spine. *One word of caution: If your back pain is caused by a herniated disc, check with your doctor before performing flexion exercises because they may increase pressure within the discs, making the problem worse.*

Extension: With extension exercises, you bend backward. They may minimize radiating pain, which is pain you can feel in other parts of the body besides where it originates. Examples of extension exercises are leg lifting while lying prone and raising the trunk while lying prone. The theory behind these exercises is that they open up the spinal canal in places and develop muscles that support the spine.

Stretching: The goal of stretching exercises, as their name suggests, is to stretch and improve the extension of muscles and other soft tissues of the back. This can reduce back stiffness and improve range of motion.

Aerobic: Aerobic exercise is the type that gets your heart pumping faster and keeps your heart rate elevated for a while. For fitness, it is important to get at least 30 minutes of aerobic (also called cardiovascular) exercise three times a week. Aerobic exercises work the large muscles of the body and include brisk walking, jogging, and swimming. For back problems, you should avoid exercise that requires twisting or vigorous forward flexion, such as aerobic dancing and rowing, because these actions may raise pressure in the discs and actually do more harm than good. In addition, avoid high-impact activities if you have disc disease. If back pain or your fitness level makes it impossible to exercise 30 minutes at a time, try three 10-minute sessions to start with and work up to your goal. But first, speak with your doctor or physical therapist about the safest aerobic exercise for you.

**Speak with
your doctor or
physical therapist
about the safest
aerobic exercise
for you.**

Medications: A wide range of medications are used to treat chronic back pain. Some you can try on your own. Others are available only with a doctor's prescription. The following are the main types of medications used for back pain.

Analgesics: Analgesic medications are those designed specifically to relieve pain. They include over-the-counter acetaminophen (Tylenol¹) and aspirin, as well as prescription narcotics, such as oxycodone with acetaminophen (Percocet) or hydrocodone with acetaminophen (Vicodin). Aspirin and acetaminophen are the most commonly used analgesics; narcotics should only be used for a short time for severe pain or pain after surgery. People with muscular back pain or arthritis pain that is not relieved by medications may find topical analgesics helpful. These creams, ointments, and salves are rubbed directly onto the skin over the site of pain. They use one or more of a variety of ingredients to ease pain. Topical analgesics include such products as Zostrix, Icy Hot, and Ben Gay.

NSAIDs: Nonsteroidal anti-inflammatory drugs (NSAIDs) are drugs that relieve both pain and inflammation, which may also play a role in some cases of back pain. NSAIDs include the nonprescription products

¹ Brand names included in this booklet are provided as examples only, and their inclusion does not mean that these products are endorsed by the National Institutes of Health or any other Government agency. Also, if a particular brand name is not mentioned, this does not mean or imply that the product is unsatisfactory.

ibuprofen (Motrin, Advil), ketoprofen (Actron, Orudis KT), and naproxen sodium (Aleve). More than a dozen others, including a subclass of NSAIDs called COX-2 inhibitors, are available only with a prescription.

All NSAIDs work similarly: by blocking substances called prostaglandins that contribute to inflammation and pain. However, each NSAID is a different chemical, and each has a slightly different effect on the body².

Side effects of all NSAIDs can include stomach upset and stomach ulcers, heartburn, diarrhea, and fluid retention; however, COX-2 inhibitors are designed to cause fewer stomach ulcers. For unknown reasons, some people seem to respond better to one NSAID than another. It's important to work with your doctor to choose the one that's safest and most effective for you.

Other Medications: Muscle relaxants and certain antidepressants have also been prescribed for chronic back pain, but *their usefulness is questionable*.

² *Warning:* NSAIDs can cause stomach irritation or, less often, they can affect kidney function. The longer a person uses NSAIDs, the more likely he or she is to have side effects, ranging from mild to serious. Many other drugs cannot be taken when a patient is being treated with NSAIDs because NSAIDs alter the way the body uses or eliminates these other drugs. Check with your health-care provider or pharmacist before you take NSAIDs. Also, NSAIDs sometimes are associated with serious gastrointestinal problems, including ulcers, bleeding, and perforation of the stomach or intestine. People over age 65 and those with any history of ulcers or gastrointestinal bleeding should use NSAIDs with caution.

Traction: Traction involves using pulleys and weights to stretch the back. The rationale behind traction is to pull the vertebrae apart to allow a bulging disc to slip back into place. Some people experience pain relief while in traction, but that relief is usually temporary. Once traction is released, the stretch is not sustained and back pain is likely to return. *There is no scientific evidence that traction provides any long-term benefits for people with back pain.*

Develop a healthy attitude and learn to move your body properly while you do daily activities.

Corsets and braces: Corsets and braces include a number of devices, such as elastic bands and stiff supports with metal stays, that are designed to limit the motion of the lumbar spine, provide abdominal support, and correct posture. *While these may be appropriate after certain kinds of surgery, there is little, if any, evidence that they help treat chronic low back pain. In fact, by keeping you from using your back muscles, they may actually cause more problems than they solve by causing lower back muscles to weaken from lack of use.*

Behavioral modification: Developing a healthy attitude and learning to move your body properly while you do daily activities – particularly those involving heavy lifting, pushing, or pulling – are sometimes part of the treatment plan for people with back pain. Other behavior changes that might help pain include adopting healthy habits, such as exercise, relaxation, and regular sleep, and dropping bad habits, such as smoking and eating poorly.

Injections: When medications and other nonsurgical treatments fail to relieve chronic back pain, doctors may recommend injections for pain relief. Following are some of the most commonly used injections, although some are of questionable value:

Nerve root blocks: If a nerve is inflamed or compressed as it passes from the spinal column between the vertebrae, an injection called a nerve root block may be used to help ease the resulting back and leg pain. The injection contains a steroid medication and/or anesthetic and is administered to the affected part of the nerve. *Whether the procedure helps or not depends on finding and injecting precisely the right nerve.*

Facet joint injections: The facet joints are those where the vertebrae connect to one another, keeping the spine aligned. Although arthritis in the facet joints themselves is rarely the source of back pain, the injection of anesthetics or steroid medications into facet joints is sometimes tried as a way to relieve pain. *The effectiveness of these injections is questionable.* One study suggests that this treatment is overused and ineffective.

Trigger point injections: In this procedure, an anesthetic is injected into specific areas in the back that are painful when the doctor applies pressure to them. Some doctors add a steroid medication to the injection. *Although the injections are commonly used, researchers have found that injecting anesthetics and/or steroids into trigger points provides no more relief than “dry needling,” or inserting a needle and not injecting a medication.*

Prolotherapy: One of most talked-about procedures for back pain, prolotherapy is a treatment in which a practitioner injects a sugar solution or other irritating substance into trigger points along the periosteum (the tough, fibrous tissue covering the bones) to trigger an inflammatory response that promotes the growth of dense, fibrous tissue. The theory behind prolotherapy is that such tissue growth strengthens the attachment of tendons and ligaments whose loosening has contributed to back pain. *As yet, studies have not verified the effectiveness of prolotherapy.* The procedure is used primarily by chiropractors and osteopathic physicians.

Complementary and alternative treatments: When back pain becomes chronic or when medications and other conventional therapies do not relieve it, many people try complementary and alternative treatments. While such therapies won't cure diseases or repair the injuries that cause pain, some people find them useful for managing or relieving pain. Following are some of the most commonly used complementary therapies.

Manipulation: Spinal manipulation refers to procedures in which professionals use their hands to mobilize, adjust, massage, or stimulate the spine or surrounding tissues. This type of therapy is often performed by osteopathic doctors and chiropractors. It tends to be most effective in people with uncomplicated pain and when used with other therapies. *Spinal manipulation is not appropriate if you have a medical problem such as osteoporosis, spinal cord compression, or inflammatory arthritis (such as rheumatoid arthritis) or if you are taking blood-thinning medications such as warfarin (Coumadin) or heparin (Calciparine, Liquaemin).*

Transcutaneous Electrical Nerve Stimulation

(TENS): TENS involves wearing a small box over the painful area that directs mild electrical impulses to nerves there. The theory is that stimulating the nervous system can modify the perception of pain. Early studies of TENS suggested it could elevate the levels of endorphins, the body's natural pain-numbing chemicals, in the spinal fluid. *But subsequent studies of its effectiveness against pain have produced mixed results.*

Acupuncture: This ancient Chinese practice has been gaining increasing acceptance and popularity in the United States. It is based on the theory that a life force called Qi (pronounced chee) flows through the body along certain channels, which if blocked can cause illness. According to the theory, the insertion of thin needles at precise locations along these channels by practitioners can unblock the flow of Qi, relieving pain and restoring health.

Although few Western-trained doctors would agree with the concept of blocked Qi, some believe that inserting and then stimulating needles (by twisting or passing a low-voltage electrical current through them) may foster the production of the body's natural pain-numbing chemicals, such as endorphins, serotonin, and acetylcholine.

**Acupuncture
has been gaining
increasing
acceptance and
popularity in the
United States.**

A consensus panel convened by the National Institutes of Health (NIH) in 1997 concluded that there is clear evidence this treatment is effective for some pain conditions, including postoperative dental pain. Although there is less convincing evidence to support using acupuncture for back pain and some other pain conditions, the panel concluded that acupuncture may be effective when used as part of a comprehensive treatment plan for low back pain, fibromyalgia, and several other conditions.

Acupressure: As with acupuncture, the theory behind acupressure is that it unblocks the flow of Qi. The difference between acupuncture and acupressure is that no needles are used in acupressure. Instead, a therapist applies pressure to points along the channels with his or her hands, elbows, or even feet. (In some cases, patients are taught to do their own acupressure.) *Acupressure has not been well studied for back pain.*

Rolfing: A type of massage, rolfing involves using strong pressure on deep tissues in the back to relieve tightness of the fascia, a sheath of tissue that covers the muscles, that can cause or contribute to back pain. The theory behind rolfing is that releasing muscles and tissues from the fascia enables the back to properly align itself. *So far, the usefulness of rolfing for back pain has not been scientifically proven.*

Operative treatments

Depending on the diagnosis, surgery may either be the first treatment of choice – although this is rare – or it is reserved for chronic back pain for which other treatments have failed. If you are in constant pain or if pain reoccurs frequently and interferes with your ability to sleep, to function at your job, or to perform daily activities, you may be a candidate for surgery.

In general, there are two groups of people who may require surgery to treat their spinal problems. People in the first group have chronic low back pain and sciatica, and they are often diagnosed with a herniated disc, spinal stenosis, spondylolisthesis, or vertebral fractures with nerve involvement. People in the second group are those with only predominant low back pain (without leg pain). These are people with discogenic low back pain (degenerative disc disease), in which discs wear with age. Usually, the outcome of spine surgery is much more predictable in people with sciatica than in those with predominant low back pain.

Some of the diagnoses that may need surgery include:

Herniated discs: a potentially painful problem in which the hard outer coating of the discs, which are the circular pieces of connective tissue that cushion the bones of the spine, are damaged, allowing the discs' jelly-like center to leak, irritating nearby nerves. This causes severe sciatica and nerve pain down the leg. A herniated disc is sometimes called a ruptured disc.

Spinal stenosis: the narrowing of the spinal canal, through which the spinal cord and spinal nerves run. It is often caused by the overgrowth of bone caused by osteoarthritis of the spine. Compression of the nerves caused by spinal stenosis can lead not only to pain, but also to numbness in the legs and the loss of bladder and/or bowel control. Patients may have difficulty walking any distances and may also have severe pain in their legs along with numbness and tingling.

Spondylolisthesis: a condition in which a vertebra of the lumbar spine slips out of place. As the spine tries to stabilize itself, the joints between the slipped vertebra and adjacent vertebrae can become enlarged, pinching nerves as they exit the spinal column. Spondylolisthesis may cause not only low back pain but severe sciatica leg pain.

Vertebral fractures: fractures caused by trauma to the vertebrae of the spine or by crumbling of the vertebrae resulting from osteoporosis. This causes mostly mechanical back pain, but it may also put pressure on the nerves, creating leg pain.

Discogenic Low Back Pain (Degenerative Disc Disease): Most people's discs degenerate over a lifetime, but in some, this aging process can become chronically painful, severely interfering with their quality of life.

Following are some of the most commonly performed back surgeries:

For herniated discs:

Laminectomy/discectomy: In this operation, part of the lamina, a portion of the bone on the back of the vertebrae, is removed, as well as a portion of a ligament. The herniated disc is then removed through the incision, which may extend two or more inches.

Microdiscectomy: As with traditional discectomy, this procedure involves removing a herniated disc or damaged portion of a disc through an incision in the back. The difference is that the incision is much smaller and the doctor uses a magnifying microscope or lenses to locate the disc through the incision. The smaller incision may reduce pain and the disruption of tissues, and it reduces the size of the surgical scar. It appears to take about the same time to recuperate from a microdiscectomy as from a traditional discectomy.

Laser surgery: Technological advances in recent decades have led to the use of lasers for operating on patients with herniated discs accompanied by lower back and leg pain. During this procedure, the surgeon inserts a needle in the disc that delivers a few bursts of laser energy to vaporize the tissue in the disc. This reduces its size and relieves pressure on the nerves. Although many patients return to daily activities within 3 to 5 days after laser surgery, pain relief may not be apparent until several weeks or even months after the surgery. *The usefulness of laser discectomy is still being debated.*

For spinal stenosis:

Laminectomy: When narrowing of the spine compresses the nerve roots, causing pain and/or affecting sensation, doctors sometimes open up the spinal column with a procedure called a laminectomy. In a laminectomy, the doctor makes a large incision down the affected area of the spine and removes the lamina and any bone spurs, which are overgrowths of bone, that may have formed in the spinal canal as the result of osteoarthritis. The procedure is major surgery that requires a short hospital stay and physical therapy afterwards to help regain strength and mobility.

For spondylolisthesis:

Spinal fusion: When a slipped vertebra leads to the enlargement of adjacent facet joints, surgical treatment generally involves both laminectomy (as described above) and spinal fusion. In spinal fusion, two or more vertebrae are joined together using bone grafts, screws, and rods to stop slippage of the affected vertebrae. Bone used for grafting comes from another area of the body, usually the hip or pelvis. In some cases, donor bone is used.

Although the surgery is generally successful, either type of graft has its drawbacks. Using your own bone means surgery at a second site on your body. With donor bone, there is a slight risk of disease transmission or rejection. In recent years, a new development has eliminated those risks for some people undergoing spinal fusion: proteins called bone morphogenic proteins are being used to stimulate bone generation, eliminating the need for grafts. The proteins are placed in the affected area of the spine, often in collagen putty or sponges.

Regardless of how spinal fusion is performed, the fused area of the spine becomes immobilized.

For vertebral osteoporotic fractures³:

Vertebroplasty: When back pain is caused by a compression fracture of a vertebra due to osteoporosis or trauma, doctors may make a small incision in the skin over the affected area and inject a cement-like mixture called polymethylacrylate into the fractured vertebra to relieve pain and stabilize the spine. The procedure is generally performed on an outpatient basis under a mild anesthetic.

Kyphoplasty: Much like vertebroplasty, kyphoplasty is used to relieve pain and stabilize the spine following fractures due to osteoporosis. Kyphoplasty is a two-step process. In the first step, the doctor inserts a balloon device to help restore the height and shape of the spine. In the second step, he or she injects polymethylacrylate to repair the fractured vertebra. The procedure is done under anesthesia, and in some cases it is performed on an outpatient basis.

Regardless of how spinal fusion is performed, the fused area of the spine becomes immobilized.

³ Used only if standard care, rest, corsets/braces, analgesics fail.

For Discogenic Low Back Pain (Degenerative Disc Disease)

Intradiscal electrothermal therapy (IDT): One of the newest and least invasive therapies for low back pain involves inserting a heating wire through a small incision in the back and into a disc. An electrical current is then passed through the wire to strengthen the collagen fibers that hold the disc together. The procedure is done on an outpatient basis, often under local anesthesia. *The usefulness of IDT is debatable.*

Spinal fusion: When the degenerated disc is painful, the surgeon may recommend removing it and fusing the disc to help with the pain. This fusion can be done through the abdomen, a procedure known as anterior lumbar interbody fusion, or through the back, called posterior fusion. *Theoretically, fusion surgery should eliminate the source of pain; the procedure is successful in about 60 to 70 percent of cases.* Fusion for low back pain or any spinal surgeries should only be done as a last resort, and the patient should be fully informed of risks.

Disc replacement: When a disc is herniated, one alternative to a discectomy – in which the disc is simply removed – is removing it and replacing it with a synthetic disc. Replacing the damaged one with an artificial one restores disc height and movement between the vertebrae. Artificial discs come in several designs. *Although doctors in Europe had performed disc replacement for more than a decade, the procedure had been experimental in the United States until the Food and Drug Administration approved the Charite artificial disc (<http://www.fda.gov/cdrh/mda/docs/p040006.htm>) for use.*

What Kind of Research Is Being Done?

The National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) is currently supporting a number of studies to better understand and treat back pain. Goals of current research include the following:

To compare the effectiveness of surgery versus non-surgical treatment for low back pain. Although the percentage of people having spinal surgery in the United States has increased sharply over time, there is not much information on whether back surgery is better than nonoperative treatments. One study is comparing the most commonly used surgical treatments to the most commonly used nonoperative treatments for three common back problems: herniated discs of the lumbar spine, spinal stenosis, and spinal stenosis from spondylolisthesis. The study, being conducted at 12 medical centers, will follow patients for at least 24 months after treatment to determine the medical- and cost-effectiveness of treatments.

To identify the best treatments for certain low back pain patients. Just as certain treatments are effective for some back problems and not others, the same treatment may be effective for some people and not others – even if those people have the same medical problem. Researchers at several centers will study more than 3,000 patients who have one of three common causes of back pain – herniated discs, spinal stenosis, and spondylolisthesis – and who respond well to specific treatments. Extensive testing and surveys will allow doctors to identify the best treatments for these patients.

To test the effectiveness of lumbar fusion and other treatments for disc-derived pain. Discogenic pain is low back pain due to the wearing away of a disc between the vertebrae. While treatment for this condition is often lumbar spinal fusion, its effectiveness, as well as that of other treatments, has not been established. A new study will compare the results of spinal fusion with those of nonsurgical care for patients with similar disc degeneration. Researchers will also try to find out 1) what distinguishes people who choose surgery from those who do not; 2) the consequences of common complications of spinal fusion surgery and how often they occur; 3) what predicts a good response to surgical therapy but not to other treatments; and 4) what are the characteristics and outcomes of patients who have repeat back surgery for this condition.

To measure the frequency of complications in lumbar fusion surgery. Lumbar spinal fusion is a commonly performed procedure for several back problems, including disc degeneration, spondylolisthesis, spinal stenosis, and scoliosis, but the procedure can have complications. A new study will follow 1,000 people who have spinal fusion for one of these diagnoses to find out 1) how often complications occur after surgery, 2) how the rates of specific serious complications vary with different types of lumbar fusion, 3) the consequences of specific types of complications, and 4) the characteristics of treatments or patients that predict particularly severe complications. The information will help doctors better assess the benefits versus the risks of the procedure.

To better understand the relationship between the loss of motor control and low back pain. Compared to people without back problems, those with low back pain show losses in motor control, including problems with trunk muscle response and posture. Some researchers believe that losses in motor control may predispose people to falls that result in back pain. Other researchers think losses in motor control may result from damage sustained by tissue during a fall. To explore the relationship between motor control loss and back pain, scientists will study varsity athletes to determine whether poor motor control of the lumbar spine increases the risk of low back injury. They will also study changes in the lumbar spine motor control of people with low back pain after they complete rehabilitation programs that emphasize motor control training.

NIAMS is currently supporting a number of studies to better understand and treat back pain.

To develop and evaluate a psychosocial program for people with acute low back pain. Acute low back pain is a common problem that affects people's abilities to work and function, and it contributes to high health care costs. There are few studies, however, that prove whether or not a treatment truly reduces limitation and prevents the recurrence of pain. One new project will develop a program to enhance the social support and self-efficacy of people with acute low back pain. After developing and testing the program, researchers will evaluate its effectiveness by comparing the results of 160 participants with those of 160 people receiving usual care.

To evaluate the nervous system mechanisms of low back pain. Scientists think that when a disc ruptures, material leaking from its jelly-like filling leads to inflammation and the release of chemicals that irritate cells within the spinal canal. Scientists believe that the effects of these chemicals on the nerve endings in discs and adjacent tissue lead to low back pain, while the effects on dorsal nerve roots lead to sciatica. One study will test these ideas using a variety of techniques. A better understanding of pain mechanisms related to herniated discs will allow researchers to develop better treatments.

To evaluate an Internet-based patient education program. Patient education can play an important role in managing back pain. Yet taking part in an educational program can be difficult and time-consuming for some people, particularly if they live far from an area where such a program is offered. This study, conducted with patients recruited from Silicon Valley employers and the Internet, will test the effectiveness of an Internet-based education program. Participants will receive a book and videotape, and they will interact with other program participants through a moderated Internet discussion group. Patient assessments will also be conducted through the Internet.

For More Information

National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)

National Institutes of Health

1 AMS Circle

Bethesda, MD 20892-3675

Phone: 301-495-4484 or

877-22-NIAMS (226-4267) (free of charge)

TTY: 301-565-2966

Fax: 301-718-6366

E-mail: NIAMSInfo@mail.nih.gov

www.niams.nih.gov

National Institute of Neurological Disorders and Stroke NIH Neurological Institute

P.O. Box 5801

Bethesda, MD 20824

Phone: 301-496-5751 or

800-352-9424 (free of charge)

TTY: 301-468-5981

www.ninds.nih.gov

National Center for Complementary and Alternative Medicine

P.O. Box 7923

Gaithersburg, MD 20898

Phone: 301-519-3153 (international)

or 888-644-6226 (free of charge)

TTY: 866-464-3615

Fax: 866-464-3616

E-mail: info@nccam.nih.gov

www.nccam.nih.gov

**Agency for Health Care Research and Quality
Clearinghouse**

540 Gaither Road
Rockville, MD 20850
Phone: 301-427-1364
www.ahcpr.gov

**Clearinghouse for Occupational Safety and Health
Information**

Information Services Branch MSC-13
4676 Columbia Parkway
Cincinnati, OH 45226
Phone: 513-533-8326 or
800-356-4674 (free of charge)
www.cdc.gov/niosh/homepage.html

American Academy of Orthopaedic Surgeons

P.O. Box 2058
Des Plaines, IL 60017
Phone: 800-824-BONE (2663) (free of charge)
www.aaos.org

North American Spine Society (part of AAOS)

22 Calendar Court
2nd Floor
LaGrange, IL 60525
Phone: 877-SPINE-DR (free of charge)
E-mail: info@spine.org
www.spine.org

American College of Rheumatology

1800 Century Place, Suite 250
Atlanta, GA 30345
Phone: 404-633-3777
www.rheumatology.org

Arthritis Foundation

1330 West Peachtree Street, Suite 100

Atlanta, GA 30309

Phone: 404-872-7100 or

800-568-4045 (free of charge)

www.arthritis.org

American Chiropractic Association

1701 Clarendon Boulevard

Arlington, VA 22209

Phone: 800-986-4636 (free of charge)

www.amerchiro.org

Glossary

Acupuncture – an ancient Chinese practice that involves inserting thin needles at various sites on the body to relieve pain or influence other body processes. Today, doctors use acupuncture for problems as diverse as addiction, morning sickness, and back pain.

Acute pain – the most common type of back pain. Acute pain often begins suddenly – after a fall or injury, for example – and lasts for 6 weeks or less.

Analgesics – medications designed to relieve pain. Analgesics used for back pain include those that are available by prescription or over-the-counter and those made to be taken orally or rubbed onto the skin.

Ankylosing spondylitis – a form of arthritis that affects the spine, the sacroiliac joints, and sometimes the hips and shoulders. In severe cases, the joints of the spine fuse and the spine becomes rigid.

Cauda equina syndrome – a condition in which the nerves that control the bowels and bladder are pinched as they leave the spine. Unless treated promptly, the condition can lead to the loss of bowel and/or bladder function.

Cervical spine – the upper portion of the spine closest to the skull. It is composed of seven vertebrae.

Chronic pain – the least common type of back pain. Chronic pain may begin either quickly or slowly; it generally lasts for 3 months or more.

Disc – circular pieces of cushioning tissue situated between each of the spine's vertebrae. Each disc has a strong outer cover and a soft jelly-like filling.

Discectomy – the surgical removal of a herniated disc. A discectomy can be performed in a number of different ways, such as through a large incision in the spine or through newer, less-invasive procedures using magnifying microscopes, x rays, small tools, and even lasers.

Facet joints – the joints where the vertebrae of the spine connect to one another. Arthritis of the facet joints is believed to be an uncommon cause of back pain.

Fibromyalgia – a condition of widespread muscle pain, fatigue, and tender points on the body. Fibromyalgia is one cause of low back pain.

Herniated disc – a potentially painful problem in which the hard outer coating of the disc is damaged, allowing the disc's jelly-like center to leak and cause irritation to adjacent nerves.

Intradiscal electrothermal therapy (IDT) – a treatment for herniated discs in which a wire is inserted into the disc through a small incision in the back. An electrical current is then passed through wire to modify and strengthen the collagen fibers that hold the disc together.

Kyphoplasty – a procedure for vertebral fractures in which a balloon-like device is inserted into the vertebra to help restore the height and shape of the spine and a cement-like substance is injected to repair and stabilize it.

Laminectomy – the surgical removal of the lamina (the back of the spinal canal) and spurs inside the canal that are pressing on nerves within the canal. The procedure is a major surgery requiring a large incision and a hospital stay.

Lumbar spine – the lower portion of the spine. It is composed of five vertebrae.

Osteoarthritis – a disease in which the cartilage that cushions the ends of the bones at the joints wears away, leading to pain, stiffness, and bony overgrowths, called spurs. It is the most common form of arthritis and becomes more likely with age.

Osteoporosis – a condition in which the bones become porous and brittle, and break easily.

Prolotherapy – a treatment for back pain in which a practitioner injects a sugar solution or other irritating substance into trigger points along the periosteum (tough, fibrous tissue covering the bones) to trigger an inflammatory response that promotes the growth of dense, fibrous tissue. The theory behind prolotherapy is that such tissue growth strengthens the attachment of tendons and ligaments whose loosening has contributed to back pain.

Rolfing – a type of massage that uses strong pressure on deep tissues in the back to relieve tightness of the fascia (a sheath of tissue that covers the muscles) that can cause or contribute to back pain.

Rheumatoid arthritis – a disease that occurs when the body's immune system attacks the tissue that lines the joints, leading to joint pain, inflammation, instability, and misshapen joints.

Sacroiliac joints – the joints where the spine and pelvis attach. The sacroiliac joints are often affected by types of arthritis referred to as spondyloarthropathies.

Sciatica – pain felt down the back and outer side of the thigh. The usual cause is a herniated disc, which is pressing on a nerve root.

Scoliosis – a condition in which the spine curves to one side as a result of congenital malformations, neuromuscular disorders, injury, infection, or tumors.

Spinal fusion – the surgical joining of two more vertebrae together, usually with bone grafts and hardware. The resulting fused vertebrae are stable but immobile. Spinal fusion is used as a treatment for spondylolisthesis, scoliosis, herniated discs, and spinal stenosis.

Spinal stenosis – the narrowing of the spinal canal (through which the spinal cord runs), often by the overgrowth of bone caused by osteoarthritis of the spine.

Spondyloarthropathy – a form of arthritis that primarily affects the spine and sacroiliac joints.

Spondylolisthesis – a condition in which a vertebra of the lumbar (lower) spine slips out of place.

Transcutaneous Electrical Nerve Stimulation (TENS) – a treatment designed to relieve pain by directing mild electrical impulses to nerves in the painful area of the body.

Vertebrae – the individual bones that make up the spinal column.

Vertebroplasty – a minimally invasive surgical procedure that involves injecting a cement-like mixture into a fractured vertebra to relieve pain and stabilize the spine.

Acknowledgments

The NIAMS gratefully acknowledges the assistance of James Kang, M.D., University of Pittsburgh, PA; Jeffrey Katz, M.D., Brigham and Women's Hospital, Boston, MA; William Lauerman, M.D., Georgetown University, Washington, DC; and James Panagis, M.D., M.P.H., NIAMS, NIH, Bethesda, MD, in the preparation and review of this booklet. Special thanks also go to the other individuals who reviewed this publication and provided valuable assistance.

The mission of the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), a part of the Department of Health and Human Services' National Institutes of Health (NIH), is to support research into the causes, treatment, and prevention of arthritis and musculoskeletal and skin diseases; the training of basic and clinical scientists to carry out this research; and the dissemination of information on research progress in these diseases. The National Institute of Arthritis and Musculoskeletal and Skin Diseases Information Clearinghouse is a public service sponsored by the NIAMS that provides health information and information sources. Additional information can be found on the NIAMS Web site at www.niams.nih.gov.



**U.S. Department of Health and
Human Services**

Public Health Service

National Institutes of Health

**National Institute of Arthritis and
Musculoskeletal and Skin Diseases**

**NIH Publication No. 05-5282
September 2005**