



# Hughston Health Alert

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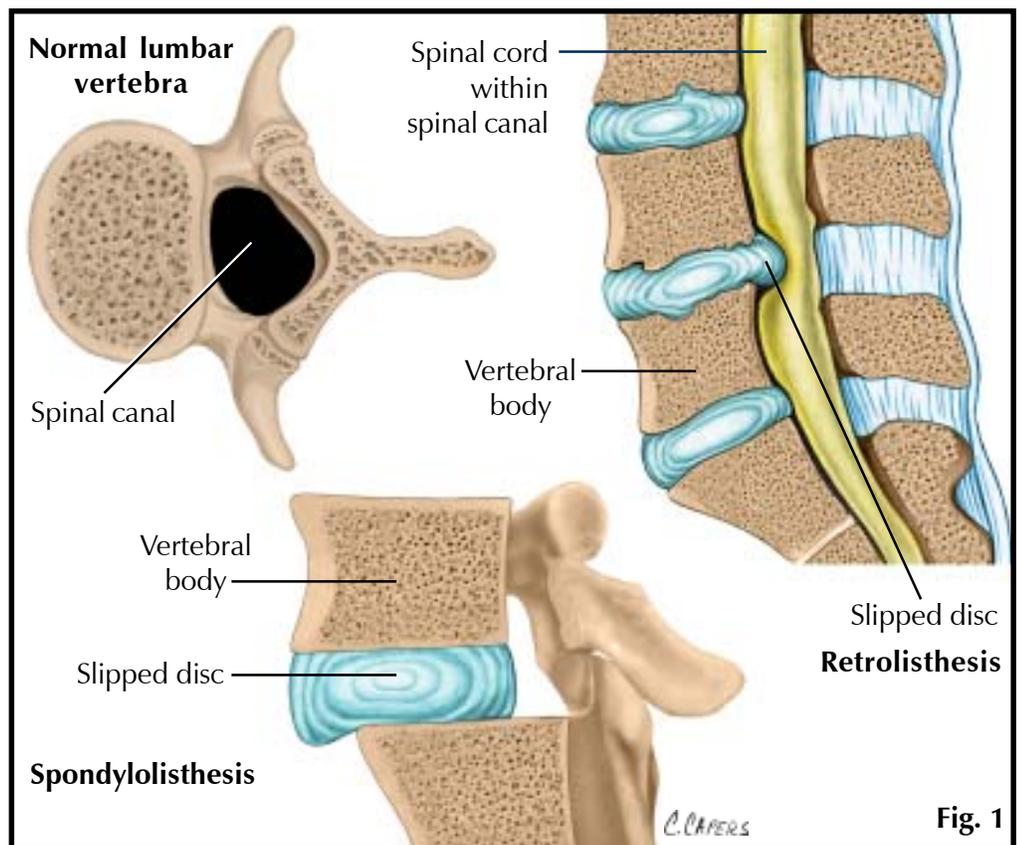
SPRING, 2003

## Degenerative Disc Disease

### When is surgery needed?

More than 65 million Americans suffer from low back pain annually. By age 50, 85% of the population will show evidence of disc degeneration. Luckily, most will have no symptoms.

Degeneration of the intervertebral disc, which is often called degenerative disc disease (DDD) or osteoarthritis of the spine, is a common disorder of the lower spine. Disc degeneration can lead to disorders such as lumbar **spinal stenosis** (narrowing of the spinal canal that houses the spinal cord and nerve roots), **spondylolisthesis** (forward slippage of the disc and vertebra), and **retrolisthesis** (backward slippage of the disc and vertebra) (Fig. 1). Actually, DDD is not a disease but, rather, a degenerative



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condition that can be painful and can greatly affect your quality of life. Disc degeneration is a normal part of aging and is generally not a problem by itself. However, when bone spurs grow adjacent to the discs, they can pinch or put pressure on the nearby nerve roots or spinal canal, and pain can occur.

#### Causes

Aging is the most common cause of disc degeneration. As the body ages,

the discs in the spine dehydrate, or dry out, and lose their ability to act as shock absorbers between the vertebra. The bones and ligaments that make up the spine also become less flexible and thicken. Unlike muscles, there is minimal blood supply to the discs so they lack the ability to heal or repair themselves.

#### Symptoms

Often, patients suffering from DDD do not show symptoms. When

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symptoms are present, however, chronic low back pain sometimes radiates to the hips, or there is an aching pain in the buttocks or thighs while walking. Similar pain may be felt or may increase while sitting, bending, lifting, and twisting.

### Understanding Disc Pain

It is not clear why some degenerative discs are painful and some are not. After an injury, some discs become painful because of inflammation. Some people have nerve endings that penetrate more deeply into the annulus fibrosus, or outer layer of the disc, than others, making the disc more susceptible to becoming a source of pain. Pain that radiates down the leg, known as sciatica or lumbago, is the result of the nerve root encountering the inner disc material, or the nucleus pulposus, an inflammatory substance that also puts pressure on the nerve (Fig. 2A). These conditions can cause symptoms such as severe leg pain, difficulty

standing and walking, and weakness or numbness in the legs. DDD can lead to a chronic debilitating condition and can have a serious negative impact on a person's quality of life. When DDD is severe, traditional nonoperative treatment is often ineffective.

### Treatment Options

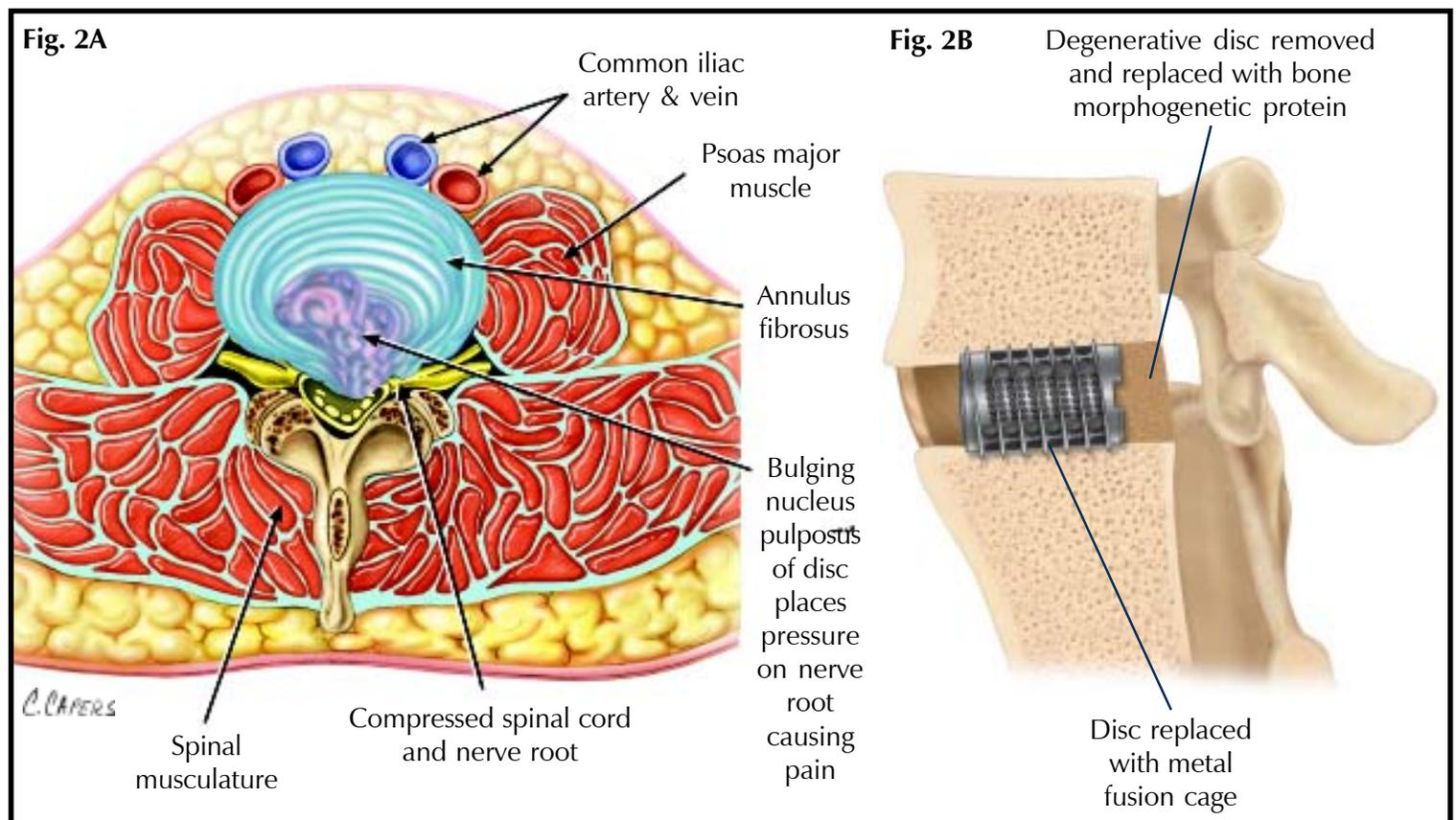
Often, DDD can be successfully treated without surgery. Physical therapy, anti-inflammatory medications, and spinal injections often provide adequate relief of these troubling symptoms. Surgery may be recommended if the conservative treatment options do not provide relief within 2 to 3 months. If leg or back pain limits your normal activity, if you have weakness or numbness in your legs, if it is difficult to walk or stand, or if medication or physical therapy are ineffective, surgery may be necessary.

Currently, surgeons at The Hughston Clinic are involved in ongoing research on the use of bone morphogenetic protein (BMP) for the treatment of degenerative disc disease. The use of BMP eliminates the need for taking bone from the hip to use in the spine during surgery (Fig. 2B). This new procedure leads to a quicker recovery and better results. Several articles based on this research have recently been published in medical journals. Dr. John D. Dorchak and I are actively working on disc replacement therapies for both the cervical and the lumbar spine.

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### Further Reading:

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# Weightlifting for Adolescents and Children

## When to begin and how much is too much?

Weight training, also known as resistance training, can have positive benefits for adolescents as well as for adults. Weight training can enhance sports performance and reduce the risk of injury by way of improved strength, enhanced muscular development, refined coordination and motor skills, and better overall fitness. Resistance training in the preadolescent child, however, has been a controversial subject. It is not clear whether the strength gains are significant enough to outweigh the risk of injury. Studies show that before puberty children are capable of strength gains without significant injury or harmful effects on growth and development,<sup>1,2</sup> although, more often, they show greater strength gains during puberty.

### When to begin

Children who are less than 12 years old or are prepubescent (before puberty) are considered preadolescent, and teenagers who are roughly 12 to 19 years old are considered adolescents. Although strength gains in preadolescent children have been noted, much of the improvement comes from neurogenic adaptation (recruitment or adaptation of muscle fibers) rather than from an increase in lean muscle mass. Preadolescent children lack androgens, which are natural steroid hormones, such as testosterone or androsterone, that control the development and maintenance of masculine characteristics. The onset of secondary sexual characteristics (pubic and facial hair, enlarged genitalia, etc.) generally

predicts the presence of these hormones. The point at which puberty begins varies between the sexes and among individuals. For the most part, children will benefit from a resistance training program after they have reached 13 or 14 years of age when their nervous system and muscle development are sufficient.



photo by Carol Capers

### How much is too much?

Children who lift weights must be monitored closely. The regimen must be very carefully supervised with emphasis on correct form and not on maximum weight or number of lifts. Resistance should not be increased until the child has learned the proper form and technique for each exercise. Additionally, a young athlete should adhere to some general principles during a training program. The American Orthopaedic Society for Sports Medicine recommends 2 or 3 training sessions per week. The program should include 20 to 30 minutes of training with warm-up and cool-down periods of stretching exercises.<sup>3</sup> Olympic-style and competitive weightlifting are very

dangerous for any age group and should be avoided entirely in the prepubescent and adolescent age groups.<sup>3-5</sup> Olympic lifting movements, such as the power clean, "snatch," and clean-and-jerk, are associated with low back injuries and spinal defects such as spondylolysis and spondylolisthesis and are not appropriate for these age groups.<sup>3</sup>

The child should begin with weight resistance that allows 3 sets of 6 to 15 repetitions. Once a child can perform 3 sets of 15 repetitions with appropriate technique and good control, the weight can be increased slowly. Repeat the process each time the child can successfully complete 3 sets of 15 repetitions at a new weight level.

Although preadolescent children have the potential to make modest strength gains, resistance training should ideally begin in adolescence. A progressive program that is closely supervised will help young athletes achieve their strength goals. Following these simple guidelines can help reduce the risk of injury and enhance the benefits of resistance training for the young athlete.

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# Strengthening Your Core

Today, core strengthening is the new catch phrase used by those who work out. A strong core is more than “six-pack abs”; it is your body’s power zone—the beginning of all movement. The body’s core includes the muscles of the shoulders, the chest, the abdomen, the hips, the pelvis, and the upper to lower back muscles.<sup>1</sup> A strong core helps your extremities do a better job while exercising, while playing sports, or while doing everyday household chores. If you are an athlete, a stable base is particularly important so you can react to the changing demands of your sport. For example, a strong core allows a baseball or softball player to adjust his or her arms to swing at a pitch in different areas of the strike zone. If the player does not have a strong core, the swing will be less powerful and less efficient.

Fig. 1



**Standard crunch on a Swiss Ball.** Contract abdominal muscles as you raise the upper torso. Do not pull on your neck. Slowly lower torso back down.

**"V" crunch.** Keep lower back flat on floor. Bring shoulders and legs up together. Slowly return to beginning position. Begin with no weight, then add weight for progressions.



Additionally, a strong core helps an athlete accelerate, decelerate, and stabilize the body during competition. Core strength increases the amount of

force your body produces, improves balance and body awareness, and decreases the incidence of overall injury.<sup>2,3</sup> For a baseball pitcher, 60% of the power generated during a pitch is from the core. Therefore, if a pitcher has a strong core, his or her balance, control, and power are greater. A strong core lets the pitcher’s body swivel around a strong base, taking more stress off the arm and dispersing the forces throughout the entire body. With a strong base for support, improved balance during the pitching motion allows the pitcher’s arm to be in a better location to make a more accurate pitch.

During workouts train your core before your extremities (arms or legs) because the core provides the strength that allows your limbs to position themselves according to the demands of the activity.<sup>2</sup> Core exercises should progress from simple to complex movements. For example, lying on the floor, you could begin by performing crunches, then the training program could progress to standing, and then to a more sport-

**Progression of balance.** Stand on one leg. Add body blade to disrupt balance. Next, progress to playing catch on one leg or tossing a weighted ball. A pillow may be added under foot to increase the balance required for progression.



Fig. 2



**Low-level balance training.** Before kneeling on a Swiss Ball, develop the core strengthening skill to "sit" balanced on the ball.



**Mid-level balance training.** After successfully sitting on a Swiss Ball, progress to kneeling on it, and add an activity to simulate a sport. This requires balance while moving an object.



**Fig. 3** photos by Carol Capers

specific activity. Changing from known to unknown surfaces, such as training on a Swiss Ball (a large ball made of durable vinyl), will help to improve your workout. Other examples of progression include performing an activity from sitting to kneeling, kneeling to standing, and two-leg to one-leg while standing on an even and uneven surface. The progression of exercises forces you to adapt to a changing environment. The more sport-specific your training is the more aware you are to all of the demands the sport places on your body. Your exercise program should include exercises that are up and down, side to side, and, most importantly, rotational.<sup>4</sup> Many activities in sports are rotational; therefore, you should train in such a manner. Once a strong base is developed, you should progress from

slow- to fast-moving activities as long as technique is not jeopardized.

Core strengthening should be the most important part of your workout. You should

**Advanced-level balance training.**

After successfully kneeling on a Swiss Ball, progress to standing on it. Add an activity to simulate a sport and increase the difficulty.



**Fig. 4**

exercise your core at least 3 times each week, and you should replicate the demands of your sport. Remember, you need a strong foundation to compete at your optimal level.

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**Extreme-level balance training.**

After mastering the advanced level, try adding a squat. This core strengthening skill requires extreme balance and should not be done alone.

## Why Do We Gain Weight as We Age?

As we age, a decrease in our physical abilities leads to a decrease in our metabolic rate (amount of energy used in a given period), which in turn contributes to weight gain. The physiological changes that accompany increasing age affect the body's composition and cardiopulmonary (heart and lung) function, thus reducing our ability to work and exercise and lose weight. Genetics, muscle mass, gender, calorie consumption versus expenditure, and lifestyle are all factors in weight gain.

### Changes Occurring with Age

A decline in our physical abilities starts around age 30, continues throughout our life, and reaches a plateau between ages 60 and 70. After the plateau, a slower decline follows. The rate of decline varies with our individual level of fitness as well as our lifestyle. The speed at which our nerves conduct impulses declines approximately 15%, resulting in decreased reaction time and slowness in performing tasks. Maximum breathing capacity decreases approximately 40% during this period. Individuals with chronic lung disease, such as emphysema, suffer a more significant decline. Cardiovascular function declines approximately one half of one percent each year starting around age 30. It is no coincidence that many world-class and endurance athletes begin gradually leaving their sport after this age. There is a 40% to 50% reduction in muscle mass during this period with a similar decline in bone mass. There is a simultaneous increase in body fat in both men and women. The metabolic rate also declines with age. This decline is mostly affected by muscle mass. Regular exercise helps to preserve muscle mass, particularly



by Charles Boyter

muscle loading exercises such as weight training, walking, and physically challenging occupations.

Behaviors such as frequent dieting have been shown to affect the resting metabolic rate and your weight. Individuals who diet frequently have a significant decline in their basal metabolic rate. This decline is prolonged and sustained for several months and cannot be attributed to that expected from a loss in muscle mass or fat free mass. Periods of extreme starvation can produce as much as a 45% decline of the metabolic system. Studies have shown that calorie restriction in short-lived animal species not only causes a decrease in the basal metabolic rate but also an increase in lifespan. Studies are now underway to evaluate calorie restriction in humans and its effect on longevity.

Physical activity refers to body movements that result in the production of energy. The type, frequency, and duration of activity, as well as rate of progress, should be considered when choosing an exercise program. Physical activity has been shown to decrease the occurrence of some chronic diseases. There is a

large body of evidence that the risk of death from disease is decreased in individuals who are physically active. The strongest evidence of this has been shown for coronary artery disease. There is moderate evidence that physical activity decreases the risk of hypertension, obesity, colon cancer, noninsulin-dependent diabetes, and osteoporosis. Physically active individuals have been shown to perform daily activities with less effort.

### General Comments

Our organ systems, such as the visual, auditory, and endocrine systems, appear to decline with age. A decline in the water content of our ligaments and tendons contributes to inflexibility and may further limit our physical abilities. However, the basal metabolic rate is clearly affected most by the decline in muscle mass, the individual's lifestyle, and underlying health. Despite these limitations, a decline in all physical abilities is not inevitable. Studies show that healthy individuals of all ages can increase their muscular strength and endurance to a proportionate degree. In fact, strength in a study group of healthy men and women ages 62 to 84 improved by as much as 57% over a brief training period.

Unfortunately, there is not an age-related decline in appetite. Most individuals consume calories in excess of requirements, resulting in weight gain over the years. To prevent this age-related gain in weight, considerable motivation is required. One has to avoid the imbalance between calorie consumption and expenditure and consider the effects of aging while maintaining a healthy lifestyle.

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## A High Fiber Diet

### For weight loss and reducing risk for certain medical conditions

Being overweight is associated with heart disease, some types of cancers, type 2 diabetes (noninsulin-dependent), stroke, arthritis, breathing problems, and depression. A diet high in fiber can help you control certain medical conditions by helping you control your weight, but fiber can also benefit you as it travels through your digestive system. Dietary fiber is the part of whole grains, vegetables, fruits, and nuts that resists digestion in the stomach and intestines and, depending on the type of fiber ingested, can help to control certain health conditions.

#### How does fiber help you lose weight?

Fiber alone contains no calories, and it provides the bulk to your diet that gives you the satisfaction of chewing, plus the feeling of a full stomach. There are 2 types of fiber: water-insoluble and water-soluble.

**Water-insoluble fiber**, found in vegetables and whole grain breads and cereals, adds bulk to the diet.

**Water-soluble fiber**, found in fruits, legumes, seeds, and oat products, exits the stomach more slowly and helps your stomach feel full longer. Fiber has several additional benefits that can help you to control your weight. For example, foods containing fiber take longer to eat, which means your stomach feels full sooner and you eat less. Foods with fiber are also satisfying so you don't feel hungry between meals.

#### What are the other benefits of a high fiber diet?

A high fiber diet and weight loss (through reduced calorie intake and

exercise) can reduce your risk of certain medical conditions. The type of fiber you digest determines your benefits. For example, a diet consisting of insoluble fibers may reduce your risk of colon cancer. Insoluble fiber passes through the body quickly carrying cancer-causing substances through the digestive tract quicker. Additionally, insoluble fiber helps to prevent or relieve constipation because it exits the body quickly. On the other hand, a diet rich in soluble fiber can help to reduce your risk of stroke, control diabetes, prevent some cancers, and avoid gastrointestinal disorders. Soluble fiber can also help lower your blood cholesterol and lower your risk of cardiovascular (heart) disease. Soluble fiber absorbs fluids as it moves through your digestive track. During the process, the fiber dissolves, thickens, and forms a gel. This gel binds itself with acids made from cholesterol from the liver and then carries it out of your body through your waste. Your body is left to pull the cholesterol from your blood stream, reducing your blood cholesterol. The gel moves slowly through the digestive system. It slows the release of sugar and slows sugar absorption, thereby moderating blood glucose levels. The gel also creates softer and bigger stools, which means fewer hemorrhoids and fewer bouts with constipation.

#### Adding fiber to your diet

The National Cancer Institute recommends a daily intake of 20 to 35 grams of fiber. However, most Americans only eat between 10 to 15 grams of fiber per day. A floating stool and easy passage indicates that your diet has enough fiber. Do not consume fiber until it causes many loose stools a day because important nutrients can be lost and vitamin deficiencies can occur.

Fiber is not the cure all for weight control. However, combined with a

nutritious diet, fiber can help you lose weight. You should begin by adding fiber slowly to your diet to avoid bloating and gas. In addition, drink plenty of fluids. Eight glasses of liquid are recommended a day because fibrous foods draw water from the intestines. Eat a variety of high-fiber foods to receive the benefits from both the water-insoluble foods and the water-soluble foods, including raw vegetables and fruits with the skins. When possible, consume high-fiber carbohydrates such as an apple instead of low-fiber carbohydrates found in apple juice.

#### Shopping for fiber

Shopping for good, nutritional foods is an important part of adding fiber to your diet. Keep a shopping list and only buy what you need. Also, do not shop on an empty stomach. Studies indicate that hungry shoppers are less discriminating and buy more junk food.

- Shop for fresh produce twice a week. Many vegetables lose their nutrients during prolonged refrigeration.

- Avoid wilted vegetables and bruised fruits.

- Choose small, young vegetables.
- Select whole grain products for greater nutritional content instead of "enriched" breads.

- Visit larger stores or health food stores for whole-grain flours and hard-to-find nuts and seeds.

Controlling your weight is more manageable with fiber and a nutritious diet. Fiber will not solve all your weight control problems, but it is a step in the right direction. A regular daily intake of fiber has many advantages that can help you even if you are healthy and at your ideal weight.

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**J. Kenneth Burkus, MD** graduated with honors from the Yale University School of Medicine in 1979. He completed his orthopaedic residency at Yale-New Haven Hospital and Newington Children's Hospital in 1984. He completed a clinical trauma fellowship with the AO/ASIF group in Switzerland and a spinal trauma and deformity fellowship at the Minnesota Spine Center in Minneapolis, Minnesota.



Dr. Burkus was initially certified by the American Board of Orthopaedic Surgeons in 1986 and was re-certified in 1996. He is a member of the North American Spine Society, the Scoliosis Research Society, the Orthopaedic Research Society, and the Orthopaedic Trauma Association. Dr. Burkus was one of three spine surgeons in the United States selected by the Scoliosis Research Society to be one of their first traveling fellows. He has published many articles concerning spinal disorder research in medical journals.

Dr. Burkus has a special interest in both adult and pediatric deformities including kyphosis and scoliosis. He also has special interest and training in adult degenerative cervical and low back conditions, spinal fractures, and spinal cord injuries.

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## Health Hint

The average person (weighing 120 to 130 pounds) should drink 64 ounces (eight, 8 oz glasses) of water a day. But, what about a person who falls above or below the average weight? To know how much water your body needs, divide your weight in half to get the number of ounces you should drink daily. If you weigh 150 pounds you need 75 ounces or about nine, 8 ounce glasses a day.



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