

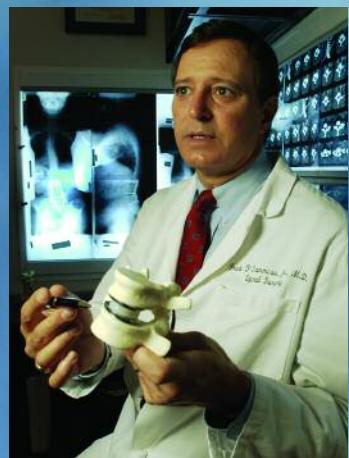
HOSPITAL
FOR SPECIAL
SURGERY:
SPECIALISTS
IN MOBILITY

WINTER 2006

Horizon



**Focus
on Total
Care of
the Spine**





At left: At the age of 30, Cindy Sherlock's scoliosis began to impinge on her ability to breathe. In May 2000, Dr. Oheneba Boachie performed fusion surgery with spinal instrumentation to straighten her spine. Following surgery, Cindy went on to have two children, a son Liam, and daughter Remington, and today enjoys a full and active life.

On the cover: Dr. Frank Cammisa, Chief of the Spine Service, performs a microsurgical decompression of the spinal nerves on a middle-aged patient with spinal stenosis. Inset: Dr. Cammisa describes the components of an artificial prosthesis that can replace a diseased vertebral disc.

HSS Expertise in Spine Care

From the tip of your neck to the base of your back, a complex configuration of 33 bones, interspersed with cartilage and surrounded by a network of nerves and soft tissue, are providing you with stability, balance, and the ability to stand erect.

This elegant structure withstands phenomenal stress and yet gives us the flexibility to reach for the stars or pick up a dime. But if the spine becomes a source of pain and the reason for disability, the experts at Hospital for Special Surgery know precisely where to look and exactly what to do if necessary.

"HSS has been involved with all of the technological breakthroughs that have been applied to spine," says Frank P. Cammisa, Jr., MD, Chief of the Spine Service. "We're at the cutting edge of both basic science research and clinical applications in spine treatment, and we're committed to training spine surgeons who will contribute to improving spinal care throughout the world. That's what makes us stand apart from other institutions."

Beginning with advancing techniques in spine fusion for disc herniation in the 1930s through the advent of image-guidance and minimally invasive surgery in the mid-1990s, and most recently, performing one of the first robotic-assisted spine surgeries in the world, HSS orthopedic surgeons have continually set the pace for progress in the diagnosis and treatment of spine disease.

The common denominator for most back problems is pain. But the underlying pathology and treatments are as diverse as the individuals affected. "You have to hone in on your patient's problem, select the right therapeutic approach, apply it in the right way with either rehab, surgery, or both...and then you're going to get a good result," says Dr. Cammisa. "At HSS, patients are very carefully evaluated from every



Dr. Oheneba Boachie-Adjei reviews X-rays of a patient following scoliosis surgery in which he used a dual-rod technique that allows an immature spine to grow.

perspective and have access to our full complement of expertise. We have imaging specialists, neurologists, physiatrists, pain management specialists, as well as surgeons – all coming together to provide the patient with comprehensive care."

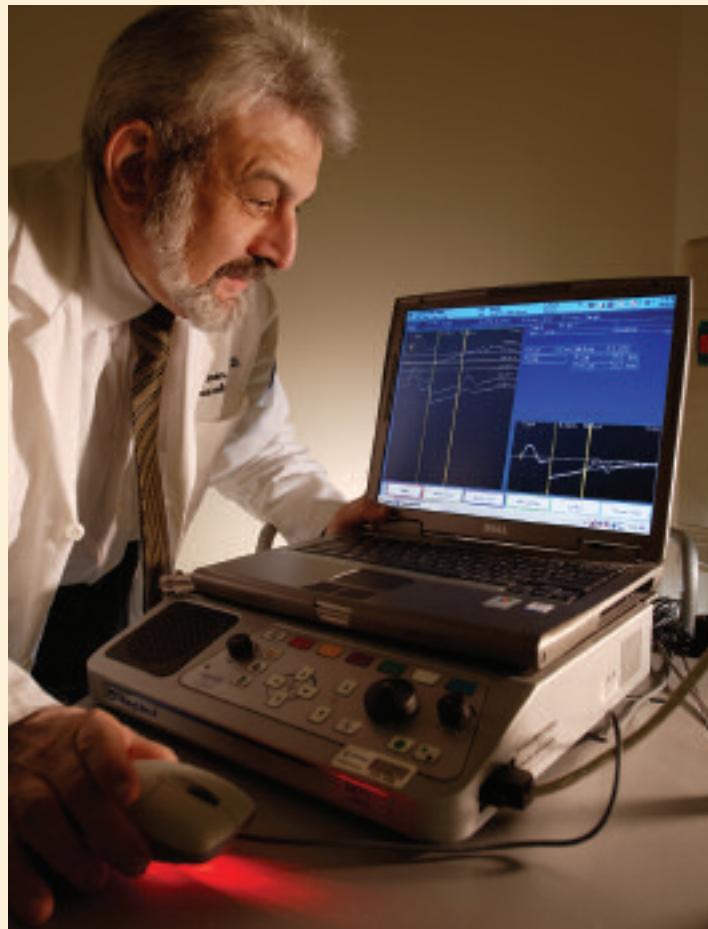
As both physicians and the patients they treat know well, spine care is not an easy field to conquer. But that challenge is exactly what drew Dr. Cammisa to the specialty. "When I was training in the 1980s, I saw that there was not a lot that could be done then, but I believed there was a tremendous potential with upcoming technologies to improve both the surgical and non-surgical care of the spine patient."

"Spine care is an area for tremendous growth and innovation," says Thomas P. Sculco, MD, Surgeon-in-Chief, "and HSS is leading the way in terms of clinical care, education, and research."

To understand the causes and conditions of the spine, a lesson in anatomy is important. The spine consists of vertebrae stacked one upon the other. Between these vertebrae are discs that act both as cushions and stabilizers. While the vertebra is a fixed structure, the disc allows you to move in different directions. The spinal cord and its nerves run through a canal in the

vertebrae, with muscles and ligaments providing strength and support. Any of the spine's components are subject to trauma, wear and tear, congenital deformities, and inflammation.

"Rheumatologists frequently see back disease in many settings – either as an isolated entity where back pain is a primary problem or in association with other diseases," says HSS rheumatologist Sergio Schwartzman, MD. "One of our roles is to differentiate between the etiologies or causes of back pain."



Dr. Moris Jak Danon, a nationally recognized specialist in nerve and muscle pathology, analyzes signals produced by electromyography to determine the electrical activity of muscles.

Nearly 80 percent of Americans will suffer back pain in their lifetime, representing some 30 million visits to physicians. Among the conditions that patients seek treatment for at HSS are herniated discs, stenosis or narrowing of the spinal canal, spondylolisthesis (a sliding forward of the vertebra), fractures, scoliosis, and autoimmune diseases, such as ankylosing spondylitis. But herniated discs are considered by many to be the most painful and disabling. When a disc herniates, part of the disc material is displaced into the spinal canal. This results in pressure on the spinal nerves, which can bring pain, numbness or weakness in one or both legs.

Pinpointing the Diagnosis

"We generally start with standard X-rays to evaluate the spine. If additional diagnostic information is needed, we employ MRI or CT to help elucidate the precise cause of a patient's symptoms," says spine specialist Richard Herzog, MD, Chief of Teleradiology in the Department of Imaging and Radiology. "At HSS, radiologists utilize the most advanced MR imaging techniques and the latest generation of CT scanners."

HSS has a dedicated orthopedic MRI center that provides high resolution images to evaluate the disc, spinal cord and nerve roots. CT is predominantly used to assess bony abnormalities and to determine the integrity of a spinal fusion. Three-dimensional CT models of the spine may be created for preoperative planning.

"Neurologists provide additional insight through evaluation of nerves emanating from the spinal cord with a clinical neurological examination that is frequently complimented by an electromyography study to measure the electrical activity of peripheral nerves and muscles," says Moris Jak Danon, MD, Chief of Neurology. "Degenerative conditions of the spinal canal and disc herniations can impinge the nerves on the spinal cord. Through neurological exams, we can pinpoint the origin and degree of injury and determine what levels of the spinal cord or peripheral nerves (at their roots) are involved."

Physiatrist Joseph Feinberg, MD, concurs. A specialist in electrodiagnostics, Dr. Feinberg performs nerve conduction studies that entail electrically stimulating and activating nerves to measure their response. "We then use very fine needles that are 'acupuncture like' that contain microscopic electrodes," says Dr. Feinberg. "They can pick up electrical signals coming from muscle, which allows us to quantify the degree of nerve injury."

Surgical Solutions for Spine Problems

It wasn't so long ago that surgery on the spine was a major and traumatic undertaking requiring a lengthy and arduous recovery. Times have changed. With the arrival of total disc replacement, minimally invasive surgical techniques, non-fusion technologies, and new fusion procedures, physicians and patients alike are seeing dramatic improvements in spine surgery.

Orthopedic surgeon Patrick O'Leary, MD, has been at the forefront of spinal fusion surgery since completing his residency at HSS in 1975. In spinal fusion, two or more vertebrae are permanently joined together with bone grafts and internal instrumentation to eliminate





Dr. Patrick O'Leary (second from left) performs a fusion to replace a damaged disc with a bone graft secured by rods to maintain proper orientation of the lumbar spine. (Below) Dr. Michael Urban, a specialist in anesthesiology for complex spine surgery, monitors the patient.

the motion between vertebral segments that may be the cause of significant pain. Fusion can also stop the progression of a spinal deformity such as scoliosis. According to Dr. O'Leary, "Spine fusion is often required in the treatment of spine fractures, spine tumors, scoliosis, and spondylolisthesis. It may also be useful in reducing pain in certain degenerative spine disorders. Spine fusion is more controversial in the treatment of discogenic back pain – the so-called 'black disc' as seen on the MRI. In this area, disc arthroplasty is currently being evaluated."

Oheneba Boachie-Adjei, MD, Chief, Scoliosis Service, is advancing surgery for early onset scoliosis with severe curvature. Dr. Boachie is participating in a multicenter



study on a dual rod technique that achieves correction through the implantation of growing rods. "We lengthen the rods gradually, which allows the immature spine to grow and avoids the need for spinal fusion at an early age," says Dr. Boachie. "This is a great advance in treating early severe curves that would have required major fusion surgery, resulting in stunted growth."

Recently, non-fusion technology has been introduced to restore or preserve motion in the spine. Today, a select group of patients is benefiting from spinal disc replacement in which the affected disc is removed and replaced by a prosthesis made of metal and plastic. "Total disc replacement is a great advance for patients with chronic, mechanical lower back pain that has not responded to non-surgical options," says orthopedic surgeon Harvinder S. Sandhu, MD.

"Spine surgery at HSS is the best model for a comprehensive team approach," says anesthesiologist James D. Beckman, MD. "At HSS, anesthesiologists get involved long before the patient is brought into the OR. Communication among anesthesiologists, the surgeons, the neuro-monitoring team, and the OR nurses is crucial



To help alleviate the chronic low back pain of Robert Frigiano, Dr. Paul Cooke will inject a combination of cortisone and anesthetic under fluoroscopic guidance to reduce inflammation of the nerves.

to ensure the best possible outcome for the patient."

Russel Huang, MD, and Andrew Sama, MD, the newer members of the HSS spine team, bring with them expertise in advanced spine surgery procedures. Dr. Huang has a keen interest in minimally disruptive decompression techniques, which minimize the amount of bone and muscle removed. "These procedures are proving beneficial to the patient with improved recovery time."

"This is a burgeoning academic field," says Dr. Sama. "By refining the technologies that are available, we will be able to help many more spine patients."

Advancing Spine Surgery through Research

"Lumbar disc replacement is only the tip of the iceberg," says orthopedic surgeon Federico P. Girardi, MD. "Studies are underway at HSS and around the world to evaluate cervical disc replacement, nucleus replacement, and other non-fusion technologies."

Dr. Frank Cammisa, Timothy M. Wright, PhD, Director, Biomedical Mechanics and Biomolecular Design, and their colleagues are pioneering non-fusion technologies that include screws to stabilize a spine without fusion and a total disc replacement made of materials that allow for 'normal' motion and flexibility.

In the basic science laboratories of Chisa Hidaka, MD, researchers are looking at gene transfer strategies that have the potential to transform the spinal fusion procedure. By inserting a new fusion gene construct they have created into the intervertebral disc during an anterior fusion procedure, they hope to induce a spinal fusion using minimally invasive techniques. "This should maximize the potential for making bone in that disc space and avoid a bone graft, something that is necessary with current techniques," says Dr. Hidaka.

Non-Surgical Approaches to Spine Care

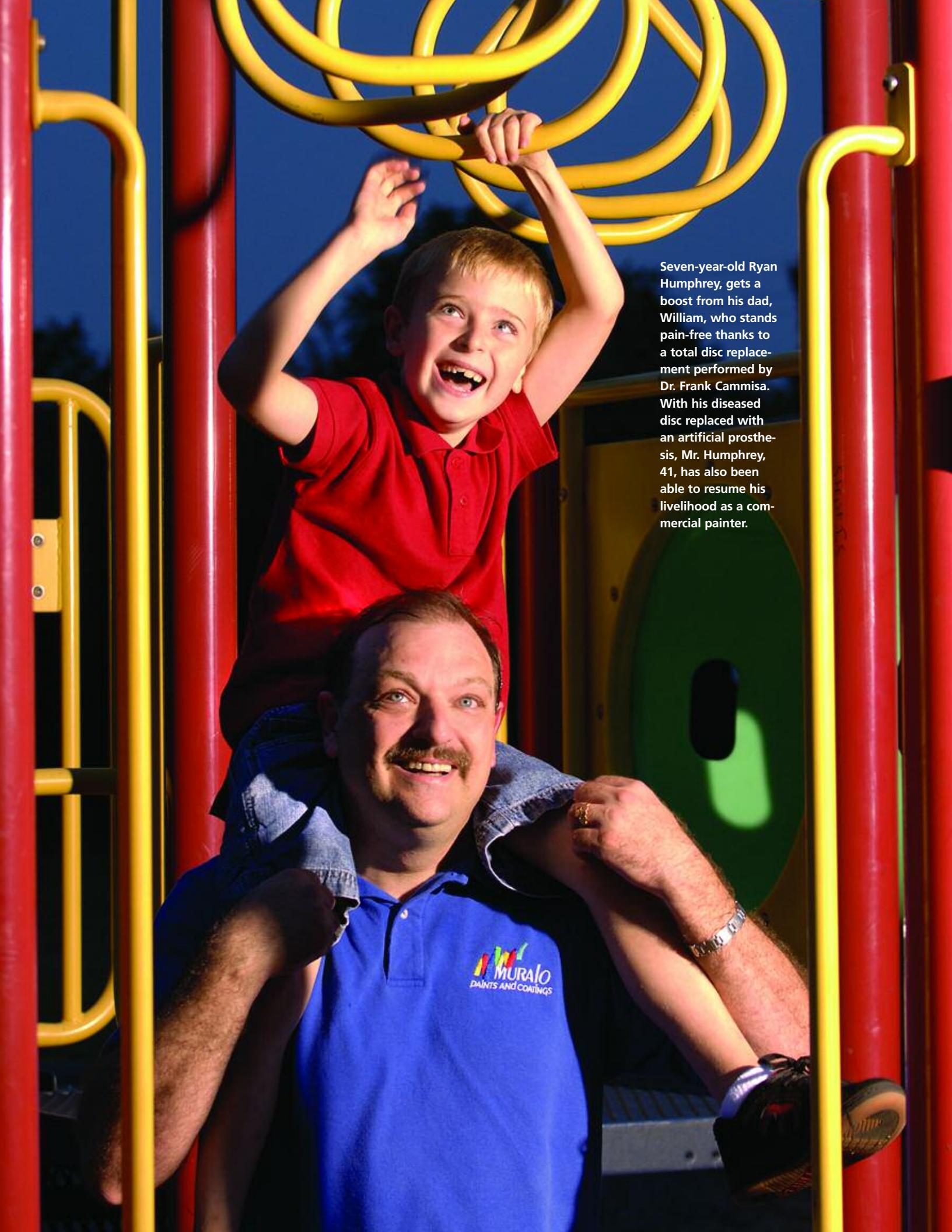
"Patients generally wish to maximize their non-surgical treatment options," says HSS physiatrist Paul M. Cooke, MD, who specializes in the field of physical medicine and rehabilitation, incorporating exercise-based rehabilitation and pain management in the non-operative treatment of spinal disorders. "One of the strengths of our field is to look at the whole patient to identify the source of the pain as well as any contributing factors, pinpoint a precise diagnosis, and ultimately to develop the appropriate treatment plan for that individual."

Pain management modalities include targeted epidural steroid injection under fluoroscopic guidance and intradiscal electrothermal therapy (IDET). "IDET works well for properly selected patients," says physiatrist Christopher Lutz, MD. "When there is a tear in the disc wall, we apply high heat directly to the inside of the disc to repair the tear and promote healing."

"Most patients will be treated with a combination of physical therapy, medication and injection procedures," says Seth A. Waldman, MD, Director of Pain Medicine. "For patients who have tried these measures without success, we may recommend implanting a spinal cord stimulator – a permanent, implantable system that stimulates the part of the spinal cord where the pain is originating. Implantable infusion devices that deliver medication directly into the spinal fluid may also offer relief."

"A major strength at HSS is the close relationship between surgeons and pain management doctors," says pain management specialist/anesthesiologist David Y. Wang, MD. "Our procedures prove valuable post-operatively to help patients recover from surgery as well as in addressing chronic pain."

"Our goal is to minimize patients' discomfort and maximize their potential," says Barbara Wukovits, RN, Assistant Director, Acute Pain Service. "Our staff is attuned to the nature of the patient's pain and how it impacts their lives. We're not just here to treat the pain...we care about them." ■



Seven-year-old Ryan Humphrey, gets a boost from his dad, William, who stands pain-free thanks to a total disc replacement performed by Dr. Frank Cammisa. With his diseased disc replaced with an artificial prosthesis, Mr. Humphrey, 41, has also been able to resume his livelihood as a commercial painter.

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Backing Spinal Research

Finn M.W. Caspersen knows all too well the toll that back pain can take on one's life. The businessman (chairman and CEO of Knickerbocker LLC) and philanthropist came to Hospital for Special Surgery several years ago for relief of an acute and incapacitating back pain attack. Familiar with HSS through longtime friend Thomas P. Sculco, MD, Surgeon-in-Chief, Mr. Caspersen knew just where to go for help.

"I've had just about every back problem you can have," says Mr. Caspersen. "Not only do you lose flexibility, agility, strength and even balance, but the continual pain is overwhelming. There is no escape from it."

"Having done extensive research for my own back problems, I came to the conclusion that HSS was clearly the best spinal/orthopedics hospital in the world, with treatment managed by incredibly competent surgeons and physiatrists working together for a common goal," he says.

Surgery with Frank P. Cammisa, MD, Chief of the Spine Service, ongoing therapy with HSS physiatrist Paul M. Cooke, MD, and his own personal commitment to resuming his active life, returned him to good health. "Their care has made a huge difference in my life," says Mr. Caspersen, who continues to manage his condition with periodic visits with his HSS physicians.

Pain management has also played an important role in his care. "The great majority of pain is managed incorrectly in the United States," notes Mr. Caspersen. "The pain management program at HSS is the gold standard. If I can live and work without pain, I'm much more productive and, of course, my quality of life is much better."

An international equestrian sportsman and founder of the Princeton International Regatta Association, Mr. Caspersen continues to enjoy these pursuits, among others, while maintaining a rigorous exercise program that includes regular cardiac and strength workouts.

While Mr. Caspersen has a deep personal interest in spinal disorders – his son, who is in his 30s, has similar back problems – he also sees the broader impact that spine disease has on society, affecting people of all ages, many in the prime of life.

"There are people in their 30s, 40s, and 50s who are otherwise physically fit, at the



Finn M.W. Caspersen, patient and patron of HSS

height of their careers, and who periodically are immobilized by back pain," says Mr. Caspersen. "Back pain not only changes one's quality of life, but it also diminishes the ability of individuals to function in full. It's taking its toll – and it's an expensive toll – on both sides of the ledger. You have a huge loss of productivity of people in their peak years, and you have huge medical costs."

The answer, he believes, lies in part in finding simpler therapeutic solutions where, he says, major back surgery isn't always required to repair and restore the spine. To help achieve those solutions, Mr. Caspersen – a member of the HSS Board of Trustees since 2000 – has been a major supporter of the Hospital's spinal research and medical education programs, including the funding of a spinal research fellowship.

"HSS has embarked on a full-scale research program with the most able people in the country – in the world, for that matter," he says. "Though one can't guarantee where the breakthroughs will come from, I believe it's likely to be at Special Surgery if you look at past history, and the payback for society will be tremendous."

"They don't quite have all the answers yet," he adds, "but I hope – in some small part – to be of assistance in their quest." ■

Total Spine Care at HSS

Setting Standards for Scoliosis Treatment

Oheneba Boachie-Adjei, MD, Chief of the Scoliosis Service, has been evaluating with great success a new bracing system for adolescent idiopathic scoliosis that is made up of a vest, pelvic support and a strap – providing extra room for breathing and flexibility, while correcting the spinal curvature. Dr. Boachie and his colleague, orthopedic surgeon Bernard A. Rawlins, MD, use sophisticated fusion techniques and new instrumentation to surgically correct progressive curves, enhancing the recovery of patients like 14-year-old Paul Bailey (at right). Working together with Roger F. Widmann, MD, Chief of Pediatric Orthopedics, they are also implementing new endoscopic procedures that allow them to access the spine through the chest cavity, and perform the fusion with three or four small incisions.



Patients who come to Hospital for Special Surgery for spinal disorders find a full array of extraordinary care...from specialists in imaging to physiatrists with expertise in non-operative therapies to orthopedic surgeons who are pioneering surgical techniques with technologies that are state-of-the-art.



Addressing Inflammatory Back Disease

Ankylosing spondylitis is a form of arthritis due to an inflammatory process involving, most commonly, the sacroiliac joints, although it can affect the entire spine. According to Sergio Schwartzman, MD, HSS rheumatologist, "People with inflammatory back diseases generally have pain that improves on exercise and is made worse by rest." A systemic autoimmune illness, ankylosing spondylitis can also affect organ systems. Therapy has changed dramatically in recent years with the availability of anti-TNF (tumor necrosis factor) agents. These medications have previously proved successful in halting the progression of rheumatoid arthritis.



Cervical vertebrae (C7)

Replacing Degenerative Discs

In spinal disc replacement surgery, the affected disc is removed and replaced by a prosthesis made of metal and plastic (shown here). The procedure is proving beneficial for improving function and reducing pain for patients with degenerative disc disease that has not responded to other interventions.

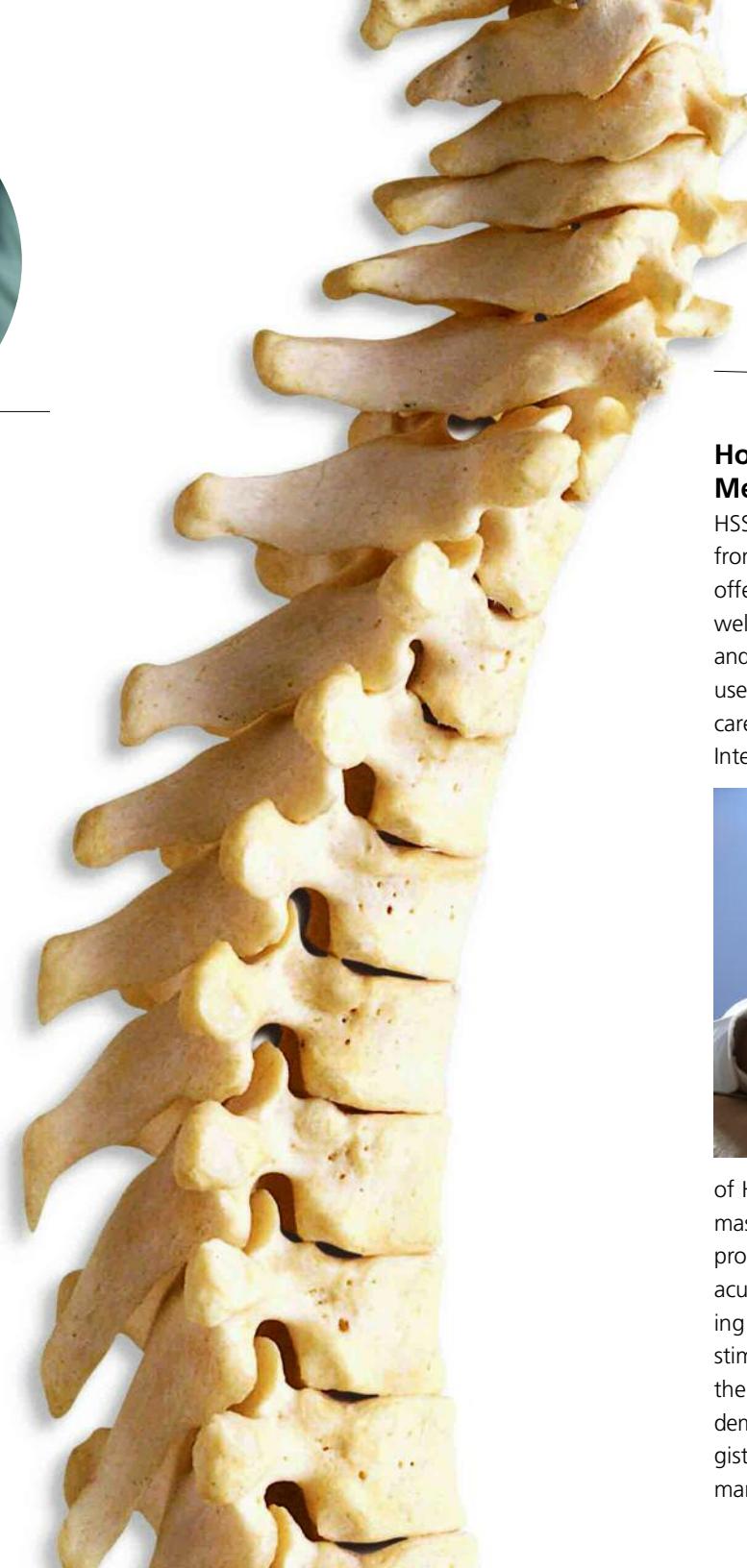


Offering Help for Osteoporosis Fractures

"Nearly a million vertebral fractures occur in the U.S. each year," says Joseph M. Lane, MD, Chief of the Metabolic Bone Disease Service.

Dr. Lane is able to alleviate pain from vertebral compression fractures for patients like Joyce Searles using kyphoplasty. "We insert a balloon in the affected vertebra and inflate it to create a cavity that can be filled with bone cement, stabilizing the fracture, while improving alignment and posture."

*Thoracic vertebrae
(12)*



How Complementary Medicine Can Help

HSS spine patients can also benefit from a unique outpatient program offering rehabilitation services, as well as a number of complementary and holistic modalities that can be used in partnership with traditional care for spinal disorders. At the Integrative Care Center, an affiliate



of HSS, services include reflexology, massage therapy, a Pilates exercise program, chiropractic services, and acupuncture – the practice of inserting very fine needles into the skin to stimulate specific anatomic points in the body for therapeutic purposes, as demonstrated here by anesthesiologist Jeffrey Ngeow, MD, an HSS pain management specialist.



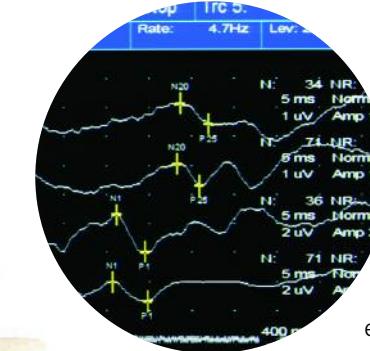
At the Forefront of Fusion Surgery

In spinal fusion (shown in the model above), two or more vertebrae are fused together with bone grafts and internal devices, such as metal rods, to stabilize the spine or correct a deformity. For decades, HSS surgeons have been involved in the development of fusion systems, materials for instrumentation, and alternatives for bone grafts. Candidates for spine fusion may also include patients who had recurrent disk herniations or who have had previous back surgery.



Taking the Inside View

Richard Herzog, MD, Chief of Teleradiology, and his colleagues utilize advanced imaging techniques to diagnose spinal disorders. Initial X-rays are useful to assess spinal alignment and to detect bony abnormalities. When additional information is required, MRI (shown here) provides the most comprehensive information concerning the condition of the spine and its neural elements. CT is used to detect bony abnormalities and to determine the integrity of a spine fusion.



Advancing Knowledge in Neurology

Under the direction of Morris Jak Danon, MD, Chief of Neurology, neurologists perform electromyography and nerve conduction studies – valuable tools to measure electrical signals produced by peripheral nerves emanating from the spinal cord. These studies also help to determine if the spine problem is due to a primary muscle disease.

Lumbar vertebrae (5)



Managing Chronic Back Pain

"As people age, degenerative disc disease and arthritis are almost universal," says Seth A. Waldman, MD, Director of Pain Medicine. Many will live with their pain successfully,

A Source of Care for Skeletal Dysplasia

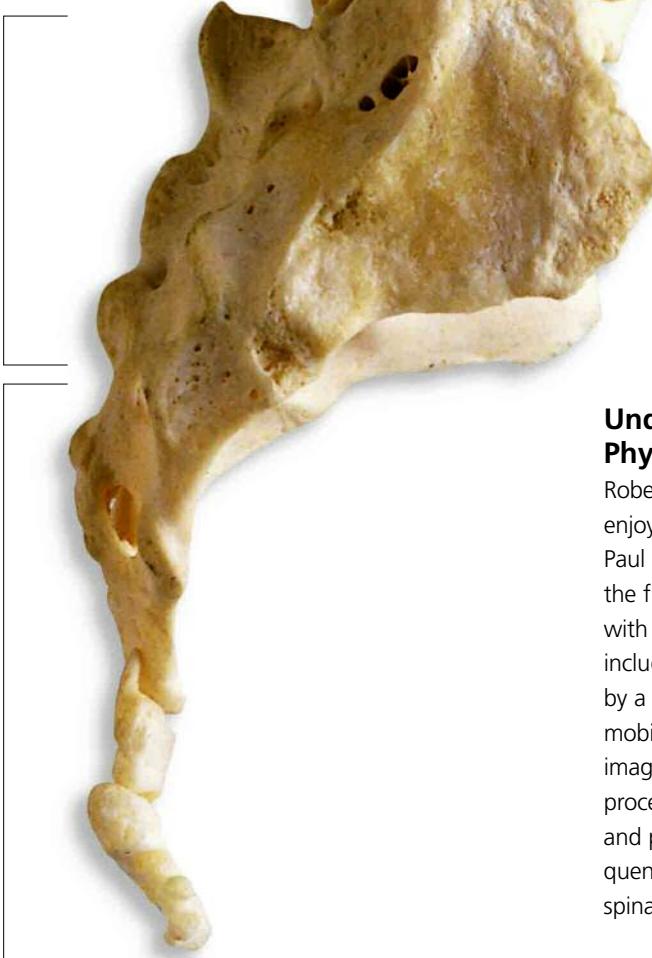
Patients with skeletal dysplasia – a condition characterized by abnormal bone growth and shortened stature – are born with smaller spinal canals.

"As a result, these patients can develop narrowing of the space around the nerves and the spinal cord at a much earlier age," says James C. Farmer, MD, an orthopedic surgeon who manages the spine problems of Bryant Martin and other patients in HSS' Center for Skeletal Dysplasias. "With surgery, we can decompress the area around the spinal cord and nerve roots, which can be effective in eliminating symptoms."



*Sacrum
vertebrae
(5 fused
vertebrae)*

*Coccyx
vertebrae
(4 fused
vertebrae)*



Physical Therapy First

According to Holly Rudnick, PT, Rehabilitation Services, left, many patients can benefit from exercise-based programs that combine flexibility and stretching routines with protocols to strengthen the abdomen, back and pelvis. "Our goal is to improve patients' function, decrease their pain and return them to the activities that they have been unable to do since the onset of their back problem," says Ms. Rudnick.



will have their pain managed with a combination of physical therapy, medication, and injection procedures. For inexorable back pain, pain management specialists apply state-of-the-art techniques, including implantable spinal cord stimulators or medication infusion pumps.

