

ABOUT THE BWH CENTER FOR PAIN THERAPY AND RESEARCH

The Brigham and Women's Hospital (BWH) Center for Pain Therapy and Research encompasses two programs: clinical care and education is provided through the Pain Management Center, and basic science and clinical research is conducted through the Pain Research Center.

The Pain Management Center has been formally in existence since 1975. What began as one physician responsible for all the issues related to pain management at Brigham and Women's Hospital has grown into a large pain center with more than 35 employees who care for more than 20,000 patients each year.

The Pain Research Center was established in 1980. The work conducted here also has burgeoned from limited research efforts to well over 50 peer-reviewed articles, abstracts, and book chapters each year, including two cover stories in *Nature Medicine* in recent years.

In 2006 the Pain Management Center was recognized by the American Pain Society as a Center of Excellence in pain management. This award is based on recognition that the BWH Pain Center provides care that is patient-centered, state-of-the-art, evidence-based, cost-conscious, culturally appropriate, and safe.

The BWH Center for Pain Therapy and Research actively collaborates with other local health care organizations. These include: Dana-Farber Cancer Institute, for which we provide optimal pain and palliative care services; Partners HealthCare, with which we seek to improve access to pain services for all Partners patients; and the BWH Spine Center, whose aim is to bring evidence-based practice to an outcome-based model of care for patients with spinal and musculoskeletal disease. The Center also is affiliated with the International Mesothelioma Program, Children's Hospital, Spaulding Rehabilitation Hospital, and the Veteran's Administration Hospital in Boston.



VISION, MISSION, AND GOALS

VISION

Our vision is to become a leading, internationally recognized pain center, employing an interdisciplinary team approach that provides comprehensive care to our patients and their families.

MISSION

Our mission is to offer state-of-the-art, multidisciplinary treatment and research designed to improve the lives of those living with pain. We bring together a diverse group of scientists, clinicians, and other professionals who increase our knowledge and understanding of pain. Together, we strive to improve clinical practice, reduce pain-related suffering, develop new therapies, and transform public policy to better serve those with pain.

GOALS

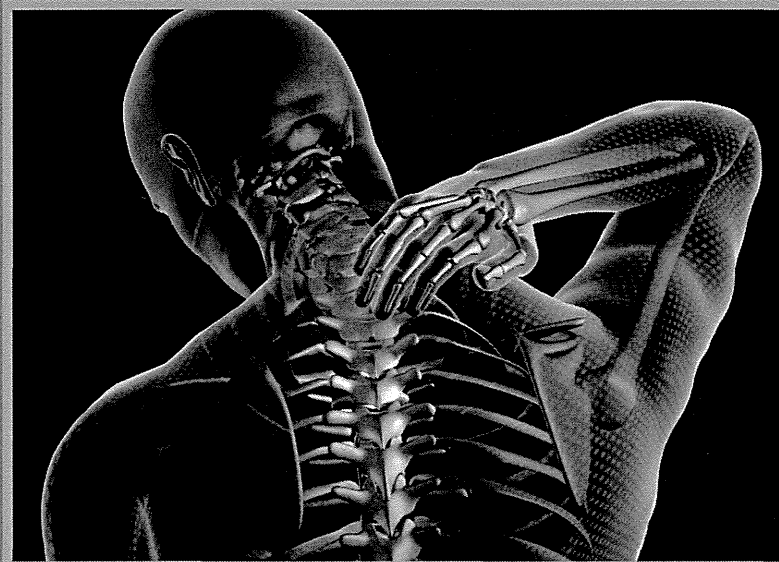
We are committed to providing the best possible quality of comprehensive medical and rehabilitative services to our patients. Quality patient care is our highest priority. Together, we aspire to:

- continue to increase our understanding of pain to improve the quality of life for all with pain-related suffering
- achieve exemplary standards in patient care, education, and clinical research
- uncover new pain mechanisms, identify new molecular targets, and develop novel drugs for pain management
- develop comprehensive, multidisciplinary programs that address a broad spectrum of pain-related problems for patients and their families
- focus on a variety of patient and family concerns within the realms of medical, physical, psychological, social, spiritual, vocational, and economic issues
- make compassion, hope, and creativity the hallmarks of our services and recognize the uniqueness of each individual.

About Pain

Everyone has experienced acute pain. This is the sensation felt when there is damage (or danger of damage) to the body. For example, placing a hand on a hot surface or spraining an ankle causes acute pain. Usually, the amount of acute pain relates closely to the amount of damage to the body. Acute pain is protective and has biological significance. Acute pain gets better with time and medical care and is expected to go away completely.

Chronic pain is different. Chronic pain lasts for a long time (three months and longer) and makes some daily activities difficult or impossible. There is chronic, intermittent pain (like having headaches) and chronic, progressive pain (due to a disease like cancer). In some cases, chronic pain can be related to a specific medical condition such as nerve injury, arthritis, or back problems. Sometimes, there is no known cause. Chronic pain can vary over time and can affect parts of the body or sometimes the entire body.



Chronic pain is a complicated disorder involving multiple body systems. Unlike acute pain, the amount of pain felt is not related to the amount of damage to the body. In fact, chronic, non-cancer pain often does not signal ongoing injury or damage. Acute pain can cause an action such as taking a hand off a hot surface, while chronic pain alerts the body even when there is nothing to be done.

Even when there is a known cause for chronic pain, there often is no cure. There are, however, treatments that can reduce pain and techniques that can help a person in pain to cope.

Chronic pain is a real medical condition that can affect every aspect of life. It requires the help of medical professionals, other pain spe-

cialists, and the pain patient working together to make things better. It also requires the work of basic scientists to uncover unknown molecular and cellular mechanisms of this pain, which may lead to new therapies.

Anyone can get chronic pain. It is estimated that as many as 50 million Americans have chronic pain at any one time. It is the chief reason that motivates people to seek medical treatment. More than 23 million surgical procedures each year in the U.S. involve significant post-operative pain. More than 50 million trauma events occur annually, resulting in considerable pain. It is estimated that 3.5 million people in the U.S. have cancer and most report some type of severe pain. The costs for treating pain-related conditions are thought to exceed \$125 billion each year.

Despite the pervasive nature of pain problems and their associated expenses, pain is not well understood or controlled. This is due in part to the subjective nature of pain. Researchers believe that

chronic pain is related to a maladaptation in the central nervous system, including spinal cord and brain. This so-called "neural plasticity" not only induces but also maintains chronic pain.

Because pain is a personal sensation, it cannot be measured objectively. It can have a powerful negative effect on mood, interactions with others, and physical functioning. It also can be very isolating and not well understood by others, including family members. Some people — infants or those who are language impaired, for example — are unable to communicate the degree of their suffering, and this makes pain even more difficult to treat. Pain is a complex phenomenon that, when not properly managed, can be devastating to those who must deal with it.

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The clinicians of the Pain Management Center care for both inpatients and outpatients at Brigham and Women's Hospital, treating about 6,500 hospitalized patients and logging 6,000 new and 19,000 return outpatient visits each year.

With national and international referrals, including those of other tertiary care center pain programs, the BWH Pain Management Center provides patient-centered care for a wide variety of acute and chronic medical pain conditions, including pain related to cancers. The program employs state-of-the-art approaches to procedural and implantable techniques as well as bio-behavioral therapies and complementary medicine methods. For some eligible patients, an array of cutting-edge treatments is available through participation in clinical trials.

PHILOSOPHY OF CARE

The center's philosophy is based on a unified approach to the evaluation and management of pain problems, focusing on comprehensive, interdisciplinary care of the whole patient – with consideration not only to physical functioning but also to lifestyle and emotional health. The center is considered a model for the use of interventional and non-interventional treatment approaches, which include:

- comprehensive pain evaluation
- cognitive behavioral therapy
- medication management with pharmacological therapy
- biofeedback
- acupuncture
- physical and occupational therapy
- mind/body therapy
- neural blockade procedures
- radiofrequency lesioning
- chemical neuroablation
- implantation of spinal cord stimulators and intrathecal pumps
- epidural portacaths, vertebroplasty, and kyphoplasty
- substance abuse assessment, suboxone therapy, and opioid compliance counseling
- multidisciplinary pelvic pain
- painful neurologic disorders
- ultrasound-guided interventional procedures
- state-of-the-art, comprehensive, back pain management.

USING INFORMATION TECHNOLOGY

The Pain Management Center also is a leader in the use of information technology to improve quality, safety, and effectiveness in assessing and treating patients with pain. Among the technologies used are electronic medical records, computerized provider order entry, note scanning, medication tracking programs, and electronic diary technology for

risk/benefit assessment. In addition, extensive outcome data collection includes real-time capturing of clinical outcomes using validated instruments that demonstrate the efficacy of patients' pain programs. Safety measures include universal record-keeping and the assistance of pharmacists with medication interactions and dosing.

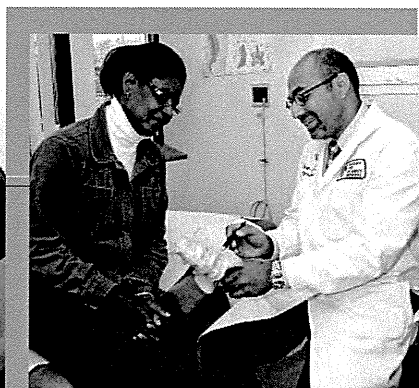
STAFF BREADTH AND DEPTH

The center's board-certified physicians represent many specialty areas including anesthesiology, neurology, orthopedics, internal medicine, physiatry, and psychiatry. Other staff specialties include advance practice nurses, physician assistants, psychologists, physical and occupational therapists, pharmacists, acupuncturists, massage therapists, and a dental and facial pain specialist. Consultants to the Pain Management Center come from a variety of areas at BWH, including Addiction Medicine, Emergency Medicine, Rheumatology, Radiology, Neurosurgery, and Palliative Care.

The multidisciplinary and multicultural staff is able to treat the complex issues surrounding patients' pain. The center also provides interpreter services, patient advocates, financial counselors, and domestic violence counselors as needed.



The BWH Center for Pain Therapy and Research prides itself in offering individualized, patient-focused services as part of a comprehensive, multidisciplinary approach to the treatment of chronic pain.



Back-To-Work Initiatives for Patients with Chronic Pain

Chronic pain is the leading cause of long-term disability in the workplace. Once the acute phase of an injury has been treated successfully, continued unmanaged pain is no longer a symptom but a barrier to returning to work.

Successful chronic pain programs require an interdisciplinary approach and a specialized treatment focus and expertise. This is needed to identify the psychosocial and occupational factors that contribute to a disability. The evaluation process focuses on identifying those who have the potential to return to work. In addition, the clinical team works toward early identification of red flags that may prevent successful outcomes.

Treatment includes a three-part approach, individualized to meet the needs of each patient:

- management of pain, including identifying causes for exacerbation of pain
- treatment of psychosocial barriers identified in the evaluation process, including ambivalence toward treatment goals
- rehabilitation, focused on fulfilling a prospective job description.

Early contact and close coordination with the patient's employer are vital for the success of the program. Many employers want to be involved in helping the employee return to work; they also are cognizant of the costs of long-term disability to themselves and the employee. Pain Management Center clinicians work with the employer to develop a transitional return-to-work program for the employee. Weekly interdisciplinary team conferences are held to evaluate progress and modify the program as required. Case managers or other representatives of employers are encouraged to attend. Follow-up after the conclusion of the active phase of treatment also is considered vital to maintain functional goals.



It Takes A Village . . . A Team Approach to Chronic Pain Management

Chronic pain affects far more than the physical body. The stress of coping with pain can cause depression, interfere with sleep and the ability to do a job, lower one's self-esteem, and strain relationships with family and friends. "Chronic pain can often be pervasive with no 'quick fix,'" said Robert Jamison, PhD, associate professor in the Departments of Anesthesiology, Perioperative and Pain Medicine, and Psychiatry. "Research shows that single treatments – such as a pill – often are not effective on their own, and chronic pain must be attacked on multiple fronts. A team approach involving several disciplines as well as the patient, who is a vital member of the treatment team, can lead to a better outcome."

Jamison believes that what a patient does about his or her condition is as important as what the center's clinicians can do. "For example, patients can learn stress reduction techniques from biofeedback and relaxation training or through 'talk therapy' with a therapist trained in behavioral medicine." A key to managing pain is to engage in some type of activity or exercise, either individually or with the help of a physical therapist. "I recommend combining medical interventions – such as medication and procedures – with changes in lifestyle and behavior, including exercise, a healthy diet, and stress reduction," said Jamison.

Another part of the multidisciplinary "package" might include such complementary/alternative therapies as acupuncture, massage, craniosacral therapy, or herbal medicine. "While the evidence for the effectiveness of these treatments is not definitive, they have helped some patients," he added.

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— Robert Jamison, PhD

Birch Peterson

Pain Management Success Enables His Outdoor Pursuits

“I will ride a motorcycle again.” That’s right at the top of Birch Peterson’s to-do list. After many major surgeries in 10 years – with much of that time spent in bed – it’s no wonder that the active outdoorsman has set himself such a goal.

Peterson, a 47-year-old father of two teenagers from Lunenburg,

decompressing nerves, removing or adding hardware. But nothing worked. Finally, my surgeon at Brigham and Women’s Hospital referred me to Dr. Narang [Sanjeet Narang, MD] at the Pain Center.”

Narang suggested an implanted neuro-stimulator, which would “confuse the pain signal from my spinal cord to my brain,” said Peterson. “You still have pain, but the pain sensation is changed and you don’t feel it in the same way – it’s more like a tingling or buzzing sensation.”

True to his live-hard, play-hard nature, “I broke that first one somehow, and it was replaced with a newer model,” he said. In 2008, he had a second stimulator implanted to work a different set of nerves, “so I now have one in my abdomen and one in my back.” Once a week, he recharges both with a charger placed over the implanted generators.

Peterson has been back to work for about a year, though no longer as an arborist. “I couldn’t work at all for 10 years,” he said. “For a while, I tried to keep my business going, by just managing things rather than doing the arborist work. But I had to give it up, and I’m now resigned to working for someone else. I drive a big truck – mostly local trips – but even that is pushing the limits for me right now.”

Physically, Peterson believes he’s regained about 60 percent of his pre-injury life. “I’m not as good physically as before, but I can still get out and do outdoor things, like walking in the woods, watching birds of prey – there’s an

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eagle’s nest near my house – and canoeing. I’ve worked very hard in the last year to get stronger and healthier.”

He attributes much of his success to the clinicians at the Pain Management Center. “The level of care is unparalleled,” he said. “I’ve been to many other local medical centers since 1998, and have been through lots of doctors – I think Dr. Narang is my 13th doctor. But he’s the only one who has hung in there for me. The thing about the Pain Center folks is that they don’t and won’t give up. And they are there whenever you need them. I remember getting an email from Dr. Narang at two in the morning; he was in India, and was responding to a question I’d had. He’s seen me through all the bumps and pitfalls along the way in my recovery, and he’s been great in dealing with my family. I consider Dr. Narang a good friend now as well as a great doctor.”



MA, was an arborist who spent a lot of time hauling chain saws up tree trunks, among other things. It’s safe to say that Peterson worked hard, lived hard, and played hard. In the fall of 1998, he ruptured a disk in his spinal column, which was repaired. The disk ruptured again, as did the one above it, “so I ended up with disk fragments in my spinal column,” he said. A couple of surgeries were performed to fuse the lower 4th and 5th vertebrae.

Finally, Peterson’s “mechanical issues,” as he calls them, were taken care of, but he was still in constant pain. “The doctors tried lots of things to relieve the pain – chasing those disk fragments,

Bill Griffiths

Work Injury Changes Officer's World

In July 2001, while working the midnight shift downtown, Boston Police Department mountain bike patrolman Bill Griffiths saw a state trooper trying to tackle a drug suspect. "The trooper was piggy-backing him, trying to bring him down," said Griffiths. "I got off my bike to help, and we all fell to the ground. Then I heard a bullet whiz past my head.

The guy tried to shoot again, but the gun jammed. After a long struggle, we finally subdued him."

While Griffiths is happy to be alive, and the state trooper is grateful to Griffiths for having likely saved his life, Griffiths was left with a severely herniated disk in his upper back. "I felt like I'd been in a car wreck and was in a lot of pain," said the 54-year-old husband and father of three grown children. He did months of physical therapy, which didn't relieve the injury or the pain. Nor did chiropractic or massage.

Eventually he agreed to surgery, but subsequently developed a severe bone infection (osteomyelitis). "My wife, Tracy, is an echocardiography technician at the Lown Cardiovascular Center, affiliated with Brigham and Women's Hospital," he said, "and she asked one of the cardiologists about the infection. He suggested I see a neurosurgeon." Three additional surgeries – including cleaning out the infection, bone grafts, and a

"superglue" procedure – stabilized Griffiths's back but didn't stop his pain.

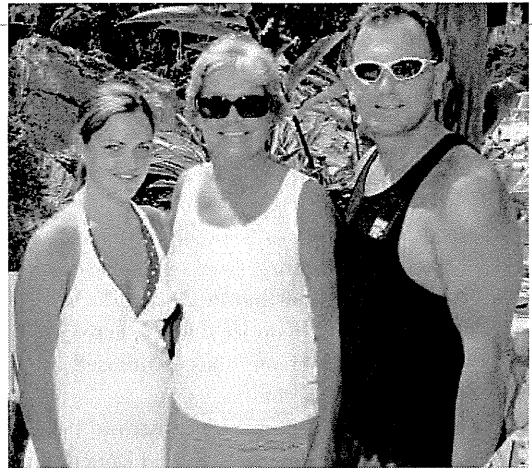
He began taking oxycontin, an opiate painkiller. Then he went on other pain medications – fentanyl and morphine. "For five or six years, I was on high doses of some painkillers," he said, "because I was needing more and more to get

the same relief. I was really dependent on drugs and began abusing them. I lived for the prescription; I counted pills; I tried to get refills early. I was an addict."

Pain medications had made Griffiths's life unmanageable. In

addition, he was suffering from post-traumatic stress disorder (PTSD). His brother, a BPD detective, had been killed in the line of duty in 1988. And Griffiths had been a target earlier in his police career – "I've had a shotgun pointed at me by armed robbers and other guns pointed at me, too, on and off the job, including being shot at in Quincy Market" – but the 2001 incident that caused his injury brought the PTSD to the forefront.

In mid-2007, clinicians at the BWH Pain Management Center confronted him. "Dr. Jamison [Robert Jamison, PhD], who had been helping me with my other issues, including depression, told me I was overly dependent on drugs and had to face up to it," said Griffiths. "Ultimately, he and Dr. Wasan [Ajay Wasan, MD, MSc] helped me from the depths



of despair to a manageable life. My wife also gave me an ultimatum – 'get clean or you're gone.' I don't know how she put up with me for those years after the injury."

Griffiths entered the detox unit at Faulkner Hospital, then went through two months of withdrawal. "I was sick as a dog, and lost 25-30 pounds," he said.

As part of getting clean, Griffiths needed to change his focus, and chose exercise. He always had been athletic, and had even run marathons. Now, he works out with weight machines at the gym – "light weights only" – and does cardiovascular exercise – "on the elliptical trainer, which is as close as I get to biking these days." He also works part-time as a private driver.

His drug regimen now consists of a couple Advil a day. He credits his turnaround, physically and emotionally, to the Pain Management Center and to his wife. "Dr. Jamison is the best – he has been just super. Dr. Wasan, too, put up with me for six years and was a great help in getting my head in the right place about my pain issues. They embody what's needed in treating pain patients – kindness and understanding. And my wife, Tracy? She's an angel."

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Jennifer Schroeder

Neuro-Stimulator, Excellent Care ‘Gave Me My Life Back’

It all began with a pain around her right eye. This pain would begin a roller-coaster year for 33-year-old Jennifer Schroeder of Averill Park, NY.

In late 2002, Schroeder consulted a neurologist for the mysterious pain, which she thought was due to migraine. “I had a number of MRIs,” she said. “No one could figure it out.” She went to a local ophthalmologist who diagnosed the problem as trochleitis, an inflammation of the ring-like cartilage near the eye. “I was told that steroid injections would help,” she said, which eased, but didn’t stop, the pain.

“I got to the point where I really couldn’t function,” she said. “I had massive bone pain. All I could do was stay in bed. At one point, I considered asking the doctor to take my eye out, if that would relieve the pain. I lost time at work

and the respect of some of my colleagues. I lost friends because I so often had to cancel plans due to the pain.”

Eventually she was referred to Edgar Ross, MD, medical director of the BWH Center for Pain Therapy and Research. With MRI disks in hand, Schroeder kept her appointment. “Dr. Ross looked at the scans and suggested implantation of a neuro-stimulator. He said they usually did this procedure for spines, but it might work for my eye pain.” Schroeder agreed, and a trial implantation was performed in the office with local anesthesia in April 2007. Wires were inserted under the



skin of Schroeder’s forehead and connected to a device at her waist that controlled the stimulator. The trial having succeeded, Schroeder returned for a more permanent implant in June 2007, this time performed as an inpatient at Brigham and Women’s Hospital.

“They put wires under my skin, which went all the way around my right ear, with an anchor behind the ear. There were more wires that ran along the jugular vein, and they all attached to a generator implanted in my right breast. I feel like the Bionic Woman,” she said.

She recovered and, by November, was a happy and healthy bride at her wedding to husband, Karl.

In addition to scheduled appointments, Schroeder has returned to the Pain Management Center a few times when she felt she was not getting optimal pain relief. During these visits, electrodes have been replaced, wires and medications adjusted, and additional functionality added to the device – including a new, rechargeable generator to replace the old one. “Now, once a week, I plug myself into the wall, put a

saucer-like device over my chest, and recharge myself,” she said.

She’s back at work at the Center for Rheumatology, a physician practice in Albany, NY, where she has worked for the past five years. She even received a promotion, and is now the practice’s infusion room secretary. She also is active in her local church and volunteers for the local chapter of the Arthritis Foundation.

Schroeder has nothing but praise for the staff and the help she has received at the Pain Management Center. “Every time I call or go in for an appointment – even as an inpatient – I’ve been treated wonderfully. I’m now functioning really well and continuing my regular, everyday life. I’m even planning to get back into hiking, which I had to give up because I was never sure when I’d be in overwhelming pain.

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Christine Feterowski

Nurse with a New Mission

While working a double shift at the Children's Hospital Boston Emergency Department in January 2002, 50-year-old Christine Feterowski, RN, of East Bridgewater, MA, hyper-extended a leg and injured her iliotibial (IT) band and extensor hip tendon. This resulted in severe, intractable extensor tendinitis, which eventually was diagnosed as complex regional pain disorder/reflex dystrophy syndrome. "The pain never



stopped, despite physical therapy and cortisone injections," said Feterowski. "I had surgery, with little relief. The pain was so bad I couldn't think straight."

She transferred from the ED to light-duty nursing, but even that was too much. "Eventually, I went back to school for a master's degree, then went into research so I wouldn't have to stand or walk so much," she said. "I developed depression, since being a nurse was part of who and what I was. I realized that I would not ever be able to do what I could before, and that the chronic pain had changed my identity, my life."

Still, the pain always had the upper hand. She said: "The pain made working difficult and it strained my relationships with my family – my husband, Gottwald,

my three children, and two grandchildren. My life changed, my friends changed. I was not doing anything I had been doing previously – I wouldn't go out, or even to the store. I just went from work to home to the couch."

Feterowski was referred to the Pain Management Center and Edgar Ross, MD, by a physiatrist at Spaulding Rehabilitation Hospital. Ross asked Feterowski about enrolling in an intrathecal drug trial, in which a catheter is placed near the spinal nerve and drugs are pumped directly to the area. "The Pain Management Center never stopped trying to help me," she said. "It's not always a big change – sometimes it's just small things that get put together. I have two distinct kinds of pain – functional pain because of the IT band injury and neuropathic pain from damaged nerves. So Dr. Ross and his team tried a number of drug combinations to find what works best for me. For the first time in five years, I was not really in pain."

When she first got the catheter implant she was hesitant to travel. Her husband's family needed him back in Germany, and he wanted her to come with him. "Dr. Ross knew I was uneasy about leaving," she said, "so he gave me his cell phone number – one that would receive international calls. He said if I had a problem, to call right away. He speaks German, so he could talk to any care providers I might need while I was there. He gave me the confidence to get on that plane."

"Dr. Ross and his team have given me hope – the notion that though I may not ever be pain-free, my life will be better. If not for them, I don't know how I would be living or how I would have gotten through my cancer treatment."

About a year following the implant, just when she thought all was going well,

Feterowski was diagnosed with invasive bladder cancer. Her surgery involved removing the bladder, small bowel, and lymph nodes and creating a new bladder.

"I was already a complicated pain management patient," she said. "And I was having this huge surgery. Most patients have an epidural for the surgery, but this was very tricky in my case because of the catheter. Dr. Ross, though, managed to do it. And he and his team were part of my post-surgery care and chemo, advocating for me all the way."

These days, Feterowski volunteers for the Bladder Cancer Advocacy Network, an organization she relied on during her treatment. She returns to the Pain Management Center every three weeks to have her pump filled and medications adjusted as needed. "I do have pain," she said, "but the Pain Center has helped me control the pain rather than the pain controlling me. That makes a huge difference. Also, Dr. Ross and his team have given me hope – the notion that though I may not ever be pain-free, my life will be better. If not for them, I don't know how I would be living or how I would have gotten through my cancer treatment."

Judy Ostrovitz

Managing Cancer Pain with Grace and Courage

Dr. Ross:

I just wanted to drop you a note and thank you for all that you have done for Judy, especially as of late as she has been hit with these sudden bouts of pain seemingly out of the blue. . . . It is your efforts that, for Judy, make life worth living. I know you hear this from people all the time, but watching Judy suffer from this often overwhelming pain is, for those closest to her, unbearable. I rarely feel more helpless than when she wakes up at three in the morning crying from the pain in her lower back.... Your efforts to manage this new round of pain over the past few weeks have been nothing short of miraculous. Knowing that you are there for her is a great comfort to us both. More than you can know. I just can't thank you enough for all you've done.

*Best wishes,
Steve Ostrovitz*

Steve Ostrovitz, a 42-year-old attorney from Framingham, MA, sent the above email to Edgar Ross, MD, medical director of the BWH Center for Pain Therapy and Research, about the care Ostrovitz's wife Judy has received to help manage her cancer pain. Seven years ago, Judy, now 44,

found a lump in her breast while doing a self-examination.

Eventually, she was diagnosed with stage 4 breast cancer with lymph node, spine, hip, and liver involvement. "Pain management was part of Judy's therapy

from day one," said Steve. Judy's pain initially was managed through the pain service at Dana-Farber Cancer Institute, but when the pain became unbearable, the couple was referred to Ross and his team at the Pain Management Center. "It wasn't until then that Judy knew what real relief felt like," said Steve. "They nailed it in terms of the right combination of medications and therapies to get Judy's pain under control."

Her therapy began with a series of injections, but when that no longer offered sufficient relief,

she had a pain pump implanted in her lower right abdomen. The pump contains a 30-day supply of a pre-mixed, individualized cocktail of medications.

Since the pump was installed, Judy returns to the Pain Management Center every 30 days for her refill. In between, she has come a few times to have the medications adjusted upward to combat her severe bone pain. "In these emergency situations, when Judy has needed more meds, the team has responded speedily and substantively," said Steve. "They take very good care of her pain – they see her right away when she has increased pain, and they actually *do* something about it."

Steve has been impressed not only with the care provided through the Pain Management Center, but with what he sees as a seamless and comprehensive system of care. "When we go to see Judy's oncologist, Dr. Jennifer Ligibel, she is on top of what's going on with Judy's pain management. She'll often say 'Dr. Ross and I talked this morning, and he gave me an update.' They are on the same page, literally and figuratively." When Judy was admitted to BWH for pain this



summer, "the people from pain management were all over her, in a good way. They threw everything they had at her, resource-wise, to get her pain under control."

He also appreciates the ease of access to get to Ross and his colleagues. "Dr. Ross is very accessible – he says he'll call you back, and he means it. He's great about email, too, and uses it very effectively to communicate with us. And you never get the sense that you are bothering him or interrupting him – it's almost like we are just the people he was hoping to talk with when we put in a call to him. He is the quarterback of an incredible medical team. To a person, they are attentive, helpful, and professional. At this stage, anything that makes Judy's life easier is a big plus. And these people have definitely done that for her, and for us."

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EDUCATION AND TRAINING



Srdjan Nedeljkovic, MD

The BWH Center for Pain Therapy and Research is committed to advancing scientific knowledge about pain and making relevant information available to patients, colleagues, and the public.

MEDICAL EDUCATION

The Center graduates eight fellows each year from its highly regarded pain medicine fellowship program, accredited by the American College of Graduate Medical Education (ACGME). Clinical team members are leaders in enhancing pain fellowship requirements to include the necessary interdisciplinary training. As well as training pain fellows, Center faculty teach up to 35 resident physicians annually through the Brigham and Women's Hospital Department of Anesthesiology, Perioperative and Pain Medicine. "Many physician graduates have gone on to start

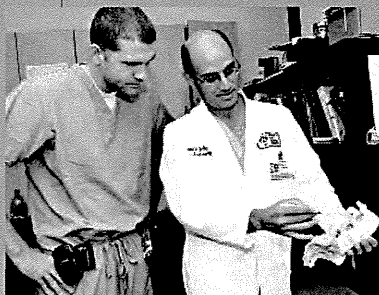
their own comprehensive pain programs in academic and private centers around the world," said Srdjan Nedeljkovic, MD, fellowship education director of the Pain Management Center.

Members of the Center have developed an interactive website for CRICO (Controlled Risk Insurance Company), an internationally renowned leader in evidence-based risk management. The site is designed to educate physicians in pain assessment, treatment, and risk management. This continuing medical education online course – "Chronic Pain: Assessment, Treatment, and Risk" – currently is being used by more than 5,000 physicians. Center staff members also teach as part of the Master of Science Program in Pain Research, Education, and Policy at Tufts University School of Medicine, the only multidisciplinary postgraduate pain manage-

ment master's program in the U.S. For nearly 20 years, Center faculty have lectured at Harvard University's annual "Principles and Practice of Pain Medicine" course.

The BWH Center for Pain Therapy and Research hosts visiting international medical colleagues who come to experience the program and take back information about the latest technology and treatment techniques for persons with pain. And faculty members serve on scientific program committees (such as the American Academy of Pain Medicine and American Pain Society) and education committees of national and international scientific organizations (such as the International Association for the Study of Pain and the American Association of Anesthesiology).

Residents and pain fellow physicians at the Harvard-affiliated BWH Center for Pain Therapy and Research get instruction about conducting extensive histories and physical examinations on all patients and performing procedures designed to reduce pain.



PROFESSIONAL PUBLICATIONS

The staff of the BWH Center for Pain Therapy and Research is committed to advancing scientific knowledge, as evidenced by multiple publications and contributions to scientific literature (an average of 30 publications per year). Staff members currently sit on the editorial boards of six pain journals and frequently are invited to lecture nationally and internationally.

PUBLIC AWARENESS

The Center has created a number of public awareness programs on pain management, frequently appear in the local and national media, and participate in national webinars.

To improve physician and staff awareness within sister institutions, Center staff created a set of pain treatment guidelines for all hospitals within Partners HealthCare (in addition to BWH, these include Massachusetts General Hospital, Faulkner Hospital, Newton-Wellesley Hospital, North Shore Medical Center, Spaulding Rehabilitation Hospital, McLean Hospital, Martha's Vineyard Hospital, Nantucket Cottage Hospital, and others).

Outside the institution, Center staff collaborate closely with hospices, lay support groups, and rehabilitation programs.

The mission of the Pain Research Center is to investigate the mechanisms and the behavior associated with chronic pain – both in animal models and with human subjects – and to develop new therapies for the cure and prevention of pain.

Chronic pain is a major public health problem worldwide. Current treatments have produced only limited success, due to an incomplete understanding of the mechanisms that cause chronic pain. Chronic pain may arise from diseases such as cancer or diabetes, from nerve injury, from prolonged or intensely acute inflammation, or from unknown causes. Pain Research Center investigators use a range of methods – molecular biology and cellular physiology, biochemistry and pharmacology, animal behavioral studies, and clinical observations – to find the common and divergent causes for chronic pain and to develop better methods of treatment for prevention, reduction, and reversal of these conditions.

The BWH Pain Research Center is highly supported, with more than \$10 million through the National Institutes of Health (NIH) and industry-sponsored grants for research extending from the basic science laboratory to clinical trials of novel agents. The combined research programs are conducted by 13 PhDs and 20 research fellows and assistants who coordinate more than 50 clinical trials and observational studies. Ongoing research consists of basic science using isolated cells and tissues, animal models, and clinical studies with pain patients.



Daily teaching sessions and weekly clinical case conferences help ensure the use of current, evidence-based medicine with input from many disciplines to improve clinical care.



BASIC SCIENCE RESEARCH

Basic science research focuses on cellular and molecular mechanisms of pain and the development of novel pain analgesics (painkillers). The basic science laboratories are located at 75 Francis Street in Boston. The labs are staffed by eight principal investigators, three senior research associates, three visiting professors (anesthesia), eight postdoctoral fellows, and five support staff. The work of these labs is supported by 12 NIH-funded grants. Researchers from the basic science labs and the clinical research team meet regularly to share information and ideas and develop translational pain protocols.

Major research projects include:

- the causes of chronic post-operative pain after surgery and chronic neuropathic pain after nerve injury
- the role of glial cells in the central nervous system in the appearance and duration of post-injury and inflammatory pain
- identification of chemicals released by tumor cells that cause cancer-related pain
- the development of novel treatments for both preventing and reversing chronic pain symptoms.

Following are brief summaries of the Center's major basic science research programs by their principal investigators. The goal of researchers in these laboratories is to improve the understanding of how pain signals are processed in the body to cause chronic pain.



Gary Strichartz, PhD



Ru-Rong Ji, PhD

MOLECULAR AND CELLULAR MECHANISMS OF PAIN

Gary Strichartz, PhD

Director of the Pain Research Center

The work of this lab has three main foci: the molecular and cellular mechanisms by which the tumor-secreted substance endothelin-1 interacts with nerves and surrounding tissues to cause pain; the functional and anatomical relations between nerves and surrounding tissues that control the duration of post-surgical pain; and the actions by which intravenous local anesthetics, such as lidocaine, can reverse or prevent chronic pain.

Among the significant advances from this laboratory over the past five years is an understanding of endothelin's broad role in many types of pain (including cancer, inflammatory, and post-incisional). Another is the observation that new local anesthetic formulations that block nerves for only a day or two are still able to reduce post-operative pain that normally lasts four or five weeks. A third breakthrough is the discovery that the intravenous infusion of lidocaine, used often in the BWH Pain Management Center to treat chronic pain, has both an acute and a separate prolonged stage of pain relief. "We believe that a better understanding of the mechanisms that account for this prolonged pain relief may lead to the development of new, more specific therapeutic drugs," said Strichartz.

SENSORY PLASTICITY, NEURAL-GLIAL INTERACTIONS, AND INFLAMMATION IN CHRONIC PAIN

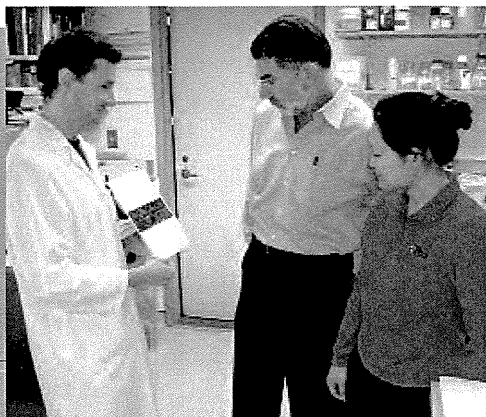
Ru-Rong Ji, PhD

The long-term goal of the Sensory Plasticity Laboratory is to uncover molecular and cellular mechanisms of chronic pain that will lead to the identification of novel targets and development of new therapeutics for the relief of chronic pain.

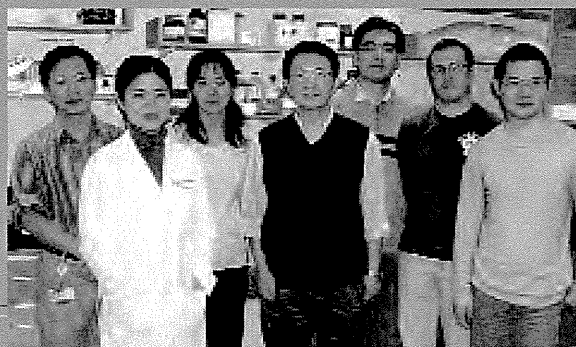
Chronic pain, such as nerve injury-associated neuropathic pain and arthritis-associated inflammatory pain, is a result of maladaptation in the peripheral and central nervous system. This neural plasticity in the sensory system induces and maintains chronic pain. Ji's lab uses multiple approaches – such as animal models of neuropathic and inflammatory pain, behavioral pharmacology, biochemistry, transgenic mice, and electrophysiology – to determine neural plasticity in primary sensory neurons and spinal cord dorsal horn neurons.

In chronic pain conditions, glial cells, such as microglia and astrocytes, also are very active. "Activation of these glial cells contributes to the development of chronic pain by releasing powerful pain mediators to interact with neurons," said Ji. "Our group is interested in identifying new signaling molecules that are critical for neuronal-glial interactions in chronic pain conditions."

Previous studies from this lab have



Researchers and teams from different labs collaborate in studying cells and cell pathways to map pain-related interactions and help unravel the mysteries of acute and chronic pain.



BASIC SCIENCE RESEARCH



Igor Kissin MD, PhD

demonstrated the important role of several proteins, enzymes, signaling molecules, and other genetic substances in regulating neural plasticity, glial activation, and chronic pain. Recently, two labs in this department have begun investigating the role of novel lipid mediators in the control of chronic pain. "I am hopeful that these studies will lead to new therapies for the relief of devastating chronic pain," said Ji.

PREEMPTIVE ANALGESIA FOR POST-SURGICAL PAIN

Igor Kissin, MD, PhD

An important area of basic science research focuses primarily on understanding the roles of peripheral nerve blockade and topical anesthesia in the treatment of chronic pain syndromes. This stems from previous work from this lab on the effect of nerve blockades in low back pain and postherpetic neuralgia.

Some studies within this lab center on understanding how anesthetic (causing loss of feeling or sensation) and analgesic (pain-killing) drugs affect the body. This work has led to other studies of anesthetic interac-

tions, resulting in the notion that general anesthesia is based not on a single general anesthetic action but on a spectrum of separate drug-related actions, even if the anesthesia is produced by one drug.

Another area of investigation is preemptive analgesia – pre-surgical treatment that prevents post-operative and chronic pain following surgery. Studies from the lab have shown that a pain treatment given before or during surgery is more effective than the same treatment given well after surgery. "Chronic post-operative pain is an important clinical problem for many procedures, including lung surgery, mastectomy, gynecological surgery, obstetrical surgery, and most forms of amputation," said Igor Kissin, MD, PhD. "Our lab is studying this problem by developing new animal models that mimic surgical procedures. Ongoing studies to document the essential signals for chronic pain development in peripheral and spinal nerve tissues will allow the identification of cells and pathways involved in prolonged pain after surgery."



Information about the molecular structure of receptors and ion channels informs basic researchers about the role these molecules play in painful conditions and the nature of drugs that may be helpful in treating pain.

TRANSLATIONAL AND CLINICAL RESEARCH

Clinical studies concentrate on sensory pain testing (sensitivity to heat, cold, and touch), innovative pain assessment tools (such as the use of PDAs to monitor pain), and the role of psychiatric factors in pain treatment response (for example, the impact of depression or anxiety on treatment outcome). Clinical researchers have investigated the role of "thinking the worst" (called catastrophizing) in patients' pain perception. They also have conducted a number of studies relating to pain and opioids (otherwise known as narcotics), such as an evaluation of usefulness of opioid therapy for noncancer pain, the development of tools for patient selection for opioids and for monitoring opioid noncompliance, and clinical trials of opioids in chronic low back pain.

Pain Research Center investigators also have conducted studies to validate a bedside clinical exam for neuropathic pain, collaborating with the Psychiatric Neuroimaging Group at Massachusetts General Hospital to explore neural correlates of chronic pain perception as seen on fMRI. These investigators work together to study how a variety of factors may impact the treatment response to pain and the processing of pain throughout the nervous system. This approach finds that through a better understanding of how the mind, brain, and body interact in patients with pain and in the treatment responses to pain, existing and future pain treatments can be used more effectively.

Researchers have conducted studies examining whether psychological factors influence pain relief and functional improvement from oral opioids. One focus of the research investigates whether patients using opioids for pain experience psychological symptoms such as craving. Another study tries to determine whether patients with neuropathic pain have abnormalities on sensory exams. These individual differences can be quantified and tracked to measure treatment improvement, such as the degree of hypersensitivity to a painful stimulus.

Researchers also study predictive factors for the success of nerve block procedures and how patients perceive their benefit from treatment. The research program also extends to brain imaging through fMRI studies examining how patients with low back pain process painful stimuli.



fMRI scanner



Christine Sang, MD, MPH



Omid Farokhzad, MD

SPINAL CORD INJURY AND NEUROPATHIC PAIN STATES

Christine Sang, MD, MPH

The Translational Pain Research program evaluates novel painkilling drugs (analgesics) in humans to target selective mechanisms of pain and to establish the most effective drugs for specific pain conditions.

“Our long-range goal,” said Christine Sang, MD, MPH, “is to improve the medical management of patients with chronic pain states, such as pain following peripheral nerve or spinal cord damage resulting from tumors, vascular lesions, inflammation, or traumatic events. Our studies fall within two broad categories: the evaluation of the effect of drugs on different components of pain; and the conduct of clinical trials evaluating new compounds and drug delivery systems in experimental and clinical neuropathic pain states.”

Sang and her group also are involved in the development of biomarkers in patients with central nervous system pain following spinal cord injury, the advancement of new clinical trial methodologies, and the assessment of mechanisms in peripheral and central nervous system pain.

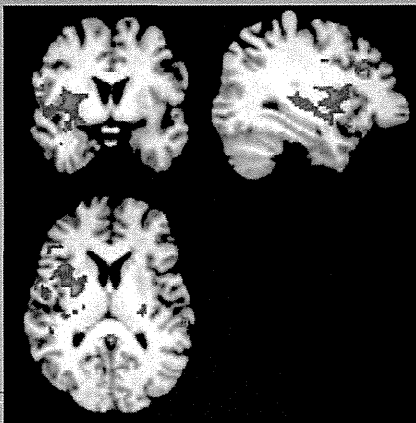
APPROACHES TO PAIN TREATMENT AND USE OF NANOTECHNOLOGY

Omid Farokhzad, MD

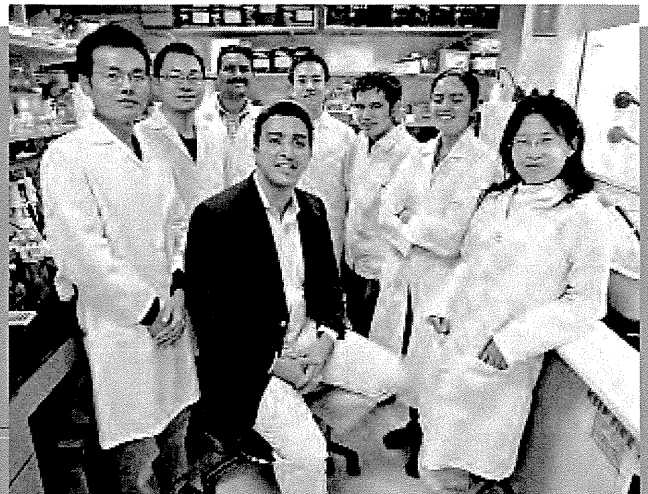
The Laboratory of Nanomedicine and Biomaterials focuses on the development of nanoparticle (ultra-fine particle) delivery systems that are capable of conveying large numbers of therapeutic molecules to targeted disease cells. The group also has developed multifunctional nanoscale systems for combined imaging, sensing, and therapeutic applications. Because many patients with advanced cancer experience pain, this new technology is designed to treat the disease to alleviate pain. “More recently, our group has been interested in developing technology for the treatment of non-cancer chronic pain states such as complex regional pain syndrome,” said Omid Farokhzad, MD.

Early work done in close collaboration with the laboratory of Professor Robert Langer at MIT focused on targeted delivery of drugs to cancer cells. “That work,” said Farokhzad, “gave us an appreciation for the challenges and opportunities that exist for using nanoparticle delivery systems, which can deliver thousands of molecules of drug with each delivery event.”

Initially, prostate cancer was used as a model to demonstrate proof of concept of these targeted nanoparticles. Recently, researchers have begun to develop targeted



Center researchers are involved in neuroimaging studies of the brain to assess individual differences in brain function related to chronic pain syndromes. The use of nanotechnology also has emerged as a way to treat specific pain-related diseases.



TRANSLATIONAL AND CLINICAL RESEARCH

nanoparticles for the treatment of various other diseases and are working with other laboratories on nanoparticles for the development of safer and more effective vaccines. “This methodology could have far-reaching implications for treating many diseases beyond the current approaches,” said Farokhzad. “Most exciting is the center’s work on developing a vaccine agent to counter addiction.”

The truly unique aspect of this lab’s work, however, is the development of multi-functional nanoparticles that have indicator elements that signal when the drug is delivered to the target cell. This provides information about the location of the disease as well as the effectiveness of the drug, which in turn provides information about the stage of the patient’s disease as well as its response to treatment.

“I think that, in the long run, the real impact of nanotechnology for oncology and pain will come with systemically administered nanoparticles that not only can image and treat, but also can sense and detect very early disease changes at a time when they can be readily treated,” he added.

PAIN AND SUBSTANCE ABUSE ASSESSMENT

Robert N. Jamison, PhD

Scientists in this laboratory are involved primarily with clinical trials that have practical application for pain patients and their clinicians. Research efforts have been clinically based with direct applicability in the assessment and management of people with chronic pain.

“Computers and information technology have been shown to improve communication, increase efficiency, and potentially enrich the clinician-patient relationship within health care,” said Robert Jamison, PhD. “Outcomes studies from our center using electronic diaries, interactive voice response technology, and pain-monitoring websites have shown that there is increased compliance and many advantages with the use of various types of technologies for people with chronic pain.”

Studies currently underway involve patient-centered computing, electronic diaries, and web-based applications. “Pain is a subjective experience that is defined only by what people say they are experiencing and is therefore subject to bias,” said Jamison. “In the clinic, for instance, when patients are asked how their pain has been since they were last

seen, their memory will be influenced by how they are feeling at the time.”

Use of daily electronic pain diaries offers the opportunity to track pain over time: patterns of daily pain can be established; individual responses to treatment can be assessed; and pain intensity ratings can be compared with other ratings such as activity, mood, and use of medication. “Patients have been found to be very compliant in completing electronic diaries, in the clinic and at home, and the data is instantly accessible. With smaller, more portable devices, electronic diaries will be the way to go in the future,” said Jamison.

PSYCHIATRIC CONDITIONS THAT INFLUENCE PAIN

Ajay D. Wasan, MD, MSc

Work in this laboratory centers on understanding the great variability in treatment response in patients with chronic pain. There is little understanding of which patients respond best or least to various medications, nerve block procedures, or rehabilitation programs for chronic pain, such as chronic low back pain.

“Our research focuses on whether comorbid psychiatric illness – which occurs very frequently – is an important predictor of pain treatment and a predic-

Center clinicians and researchers use computer and innovative technology to monitor pain, mood, activity level, and medication use. Careful monitoring with the use of e-diaries allows for greater understanding of response to treatment and accurate identification of quality-of-life issues among those with pain.





Robert N. Jamison, PhD



Ajay D. Wasan, MD, MSc



Robert R. Edwards, PhD



Vitaly Napadow, PhD

tor of the neural patterns of brain activation associated with processing painful stimuli,” said Ajay Wasan, MD, MSc. “We also are interested in developing standardized measures – both patient surveys and physical exams – to quantitatively describe the variability in symptoms and signs in patients with neuropathic pain.” These and other studies incorporate quantitative sensory testing and functional MRI (fMRI), both important tools of physiological investigation, and often combine quantitative measures with qualitative research to provide more detailed descriptions of the phenomena studied.

Among other ongoing research projects are: examining predictors of opioid analgesia, prescription opioid misuse, and nerve block response; validating a method for standardized examinations in neuropathic pain; and using fMRI to describe neural activation patterns in the brain associated with chronic low back pain.

PSYCHOPHYSICAL TESTING AND QUANTITATIVE SENSORY TESTING LABORATORY

Robert R. Edwards, PhD

Research in this lab focuses in part on biopsychosocial aspects of the pain experience, including studies of how negative emotions may magnify the physiological

impact of pain. “Among the tools we use,” said Robert Edwards, PhD, “is functional Magnetic Resonance Imaging [fMRI] to evaluate how the brain processes pain-related information. Neuroimaging techniques such as fMRI allow us to measure changes in the activity of specific brain areas under various conditions, such as when a person is in pain compared to when he or she is not. These methods are becoming increasingly important in identifying brain regions that should be targeted for specific pain treatments.”

Current projects include an fMRI study of how cognitive and emotional processes such as fear of pain can alter pain signaling in the central nervous system, and a laboratory-based study of how pain-related anxiety can alter the functioning of the immune system and stimulate an inflammatory response.

Also under study are psychological and behavioral treatments (such as relaxation training, self-hypnosis, and cognitive therapy) to improve quality of life and physiological functioning for people living with chronic pain. Another study involved examining results of quantitative sensory testing using cold, heat, and pressure sensory analyzers to assess the degree of a person’s general sensitivity

and examine the effects of opioids on pain sensitivity.

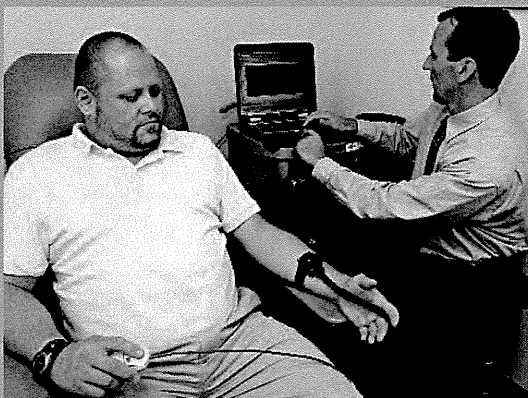
“We know that there are large differences in how patients with pain respond to different stimuli and that things like past events, anxiety, and even what you inherited from your parents can influence report of pain,” said Edwards. “Those who have a tendency to catastrophize in response to their pain seem to do less well from treatment, which can lead to depression and even thoughts of suicide. Fortunately, there are things that can be done to change the way persons think about their pain and to improve their mood.”

COMPLEMENTARY AND ALTERNATIVE MEDICINE

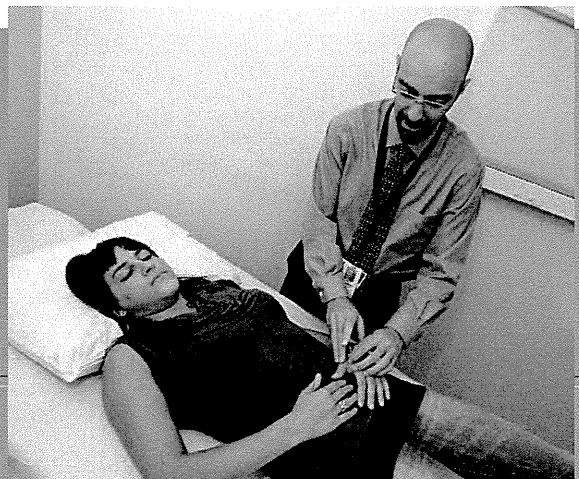
Vitaly Napadow, PhD

One focus of this lab involves examining the mechanisms behind acupuncture analgesia for a variety of chronic pain conditions. One project, in collaboration with the Martinos Center for Biomedical Imaging at Massachusetts General Hospital, uses cutting-edge neuroimaging techniques such as fMRI to evaluate brain response in chronic pain patients, and how this response changes with acupuncture.

Another project, in collaboration with Spaulding Rehabilitation Hospital, studies



Quantitative sensory testing is useful in assessing sensitivity to touch, heat, and cold to measure central processing of sensations. Acupuncture is offered as an alternative approach to treat many pain disorders.





Edward Michna, MD, JD Assia Valovska, MD

brain plasticity in patients with carpal tunnel syndrome and how this plasticity responds to a clinical course of acupuncture therapy.

“We also lead several research projects evaluating brain mechanisms of disease for chronic pain illnesses such as fibromyalgia and pelvic pain, and work with others to explore the brain network activity underlying other similarly disabling symptoms of disease, including nausea and itch,” said Vitaly Napadow, PhD.

In conjunction with BWH Pain Management Center colleagues, the lab is evaluating novel acupuncture-based treatments for chronic pelvic pain and fibromyalgia. One recently completed study centered on the impact of psychological symptoms on acupuncture response.

CLINICAL TRIALS CENTER

Edward Michna, MD, JD

The Clinical Trials Center works with pharmaceutical companies on industry-sponsored clinical trials. “Many of our studies involve experimental medications that have been shown to be effective and are close to obtaining FDA approval,” said Edward Michna, MD, JD.

“These involve testing to see how effectively various pain medications

and biologics alleviate different types of pain, including osteoarthritis, low back pain, fibromyalgia, diabetic nerve pain, and post-shingles pain, as well as opioid-induced constipation.”

Trials range from simple computer questionnaire studies that monitor pain ratings and quality of life to the most cutting-edge novel therapies, including pharmacogenetics and a number of innovative device trials. In addition, researchers currently are working on a marijuana-based oral spray that eventually may help relieve pain in patients with advanced cancers.

MULTIDISCIPLINARY APPROACH TO CHRONIC PELVIC PAIN

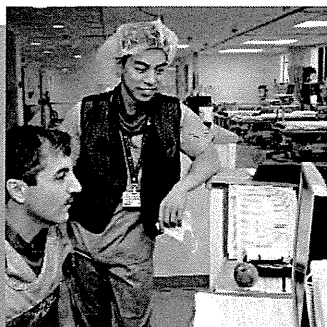
Assia Valovska, MD

Chronic pelvic pain is a complex syndrome affected by a mix of anatomic, hormonal, psychological, and nerve-related conditions. It is defined as non-menstrual pain of at least six months duration involving the pelvis, abdomen, lower back, and/or buttocks, and serious enough to cause disability or necessitate medical care. It is estimated that 15-20 percent of women aged 18 to 50 experience chronic pelvic pain.

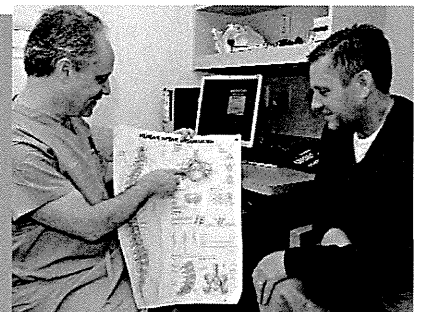
There are five general categories of chronic pelvic pain: endometri-

osis, interstitial cystitis, irritable bowel syndrome, pelvic inflammatory disease, and musculoskeletal pain conditions such as fibromyalgia. Clinical studies have confirmed that pelvic pain is more effectively treated with a comprehensive, multidisciplinary approach as opposed to the traditional, single-specialty approach. This treatment model reflects the multifactorial nature of the pain and the equal role of the treating subspecialties.

Therapeutic goals include: a thorough assessment of all aspects of the patient’s symptoms and their impact on his or her life; creating a treatment plan that addresses the needs of the patient across a variety of disciplines; setting realistic goals for pain relief; and developing coping strategies to improve quality of life. One key need is patient education, and “we plan to develop a website for people with chronic pelvic pain so that they can be informed consumers and help participate in the management of their condition,” said Assia Valovska, MD.



The Center embraces an interdisciplinary approach to treating chronic pain. This includes the careful evaluation of electronic medical records, the use of specific interventions for pain, patient instruction about the best course of treatment, and a treatment plan that includes the active participation of each individual involved.



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PHILANTHROPY

The BWH Center for Pain Therapy and Research is committed to improving chronic pain by providing the most innovative research and treatment options possible with the hope that one day no one will fear debilitating pain.

Effectively managing any pain condition takes time, talent, and dedication by committed researchers and practitioners to assess and treat the whole person. Philanthropy strengthens the Center's ability to change the lives of individuals affected by persistent pain. We welcome your support.

There are a number of ways donors can support the mission of the BWH Center for Pain Therapy and Research. All gifts are tax-deductible as allowed by law.

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A check goes to work immediately for the Center and its patients. Checks can be made payable to the Center for Pain Therapy and Research at Brigham and Women's Hospital and mailed to:

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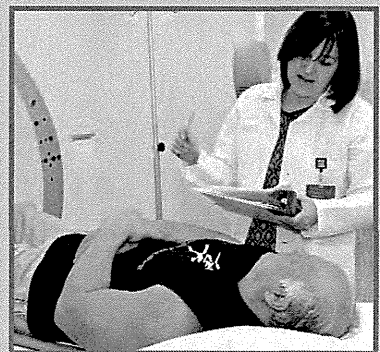
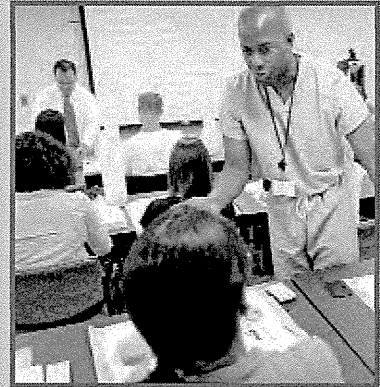
By giving appreciated securities to the Center, donors can enjoy tax benefits in addition to a charitable income tax donation. Donors or their brokers can call the BWH Development Office (617-424-4300) for instructions on making the transfer.

Bequests:

Donors may wish to include the Center in their wills or estate plans. For some donors, gifts made through their wills are the best way to make substantial contributions to the Center.

Life-Income Gifts:

Life-income gifts, such as charitable remainder trusts and charitable gift annuities, are a solid investment in the Center's future and provide a guaranteed income for donors or their named beneficiaries. Please indicate that such a contribution be directed to the BWH Center for Pain Therapy and Research.



Looking Ahead

Chronic pain is a persistent problem that is likely to affect almost everybody, either directly or indirectly, at some point in their lives. The BWH Center for Pain Therapy and Research is devoted to using the latest technology and scientific evidence to help reduce suffering among those with pain as well as to improve the lives of their loved ones. We look forward with excitement to future discoveries to effectively treat chronic pain and improve the quality of life of everyone who seeks treatment. Over the next few years, the Center is poised to increase its scope and depth through:

- pioneering breakthroughs in basic and clinical research
- increasing educational opportunities for pain specialists and providers in the community
- and serving more patients.