

New Swedish research tests efficacy of CyberKnife for breast cancer

The Seattle CyberKnife Center at Swedish Medical Center is one of a dozen sites nationwide to start testing the use of the CyberKnife® System to treat breast cancer patients following lumpectomy. Up until now, CyberKnife, which is a new approach to stereotactic radiosurgery, has had limited use in the treatment of tumors of the breast. Using computerized robotic equipment to deliver 100-200 concentrated beams of high-dose radiation from virtually any angle and location, CyberKnife quickly and automatically adjusts to the patient's slightest movement or breath. This pinpoint accuracy translates to very little, if any, damage to the surrounding healthy tissue.

Protocol gains national interest

The phase II multi-institutional study, led by principal investigator **Sandra Vermeulen, M.D.**, radiation oncologist at Swedish Medical Center and co-director of the Seattle CyberKnife Center at Swedish, is evaluating the technical feasibility and acute toxicity of partial breast irradiation (PBI) with CyberKnife, as well as quality of life issues as they relate to treatment-related side effects, cosmetic results and patient convenience.

Using CyberKnife, radiosurgery will be given in the region of the tumor bed within seven weeks of the lumpectomy and sent/axillary node sampling over a period of five to 10 days before any chemotherapy might be given. The study will accrue approximately 270 participants over a period of approximately three years. Although the protocol wanted at least three participating sites, already 12 out of the 80 CyberKnife centers nationwide have begun the credentialing process to become site participants.

Changing treatment modalities

Many controlled studies have shown breast conserving surgery and whole breast radiotherapy for early-stage breast carcinoma has an equiva-

(continued on A2)



IN THIS ISSUE

A1 CyberKnife for breast cancer
 - New research tests efficacy
 - Case Report
 - Amy's Story

A4 Neuroradiology: the imaging behind the diagnosis
 - Case Report (Neuroradiology)
 - Case Report (Musculoskeletal)
 - Case Report (Cardiac)

A6 Translating end-of-life preferences into physician orders

A7 CME Course Listing

If you have any questions or comments about articles found in these pages, or would like to suggest future topics about Swedish Medical Center, please e-mail physicians.practice@swedish.org.

CyberKnife for breast cancer

(continued from A1)

lent overall survival rate as compared with mastectomy. The benefits of this approach include superior cosmetic outcomes and reduced emotional and psychological effects. The most significant disadvantages with the current external beam radiation treatment are the prolonged treatment of approximately six weeks and the potential toxicity to the non-affected portion of the breast, underlying muscle, ribs, lung and heart.

Partial breast irradiation holds great promise

Data from recent studies suggests the main effect of radiation therapy following conservative surgery is the reduction of breast cancer recurrence at or near the primary site. Clinical studies show partial breast irradiation that targets the tissue surrounding the excision site can secure that result while truncating the treatment schedule.

Five years of study data for partial breast irradiation using multicatheter interstitial brachytherapy, a complex procedure requiring up to 20 needles placed around the excision site, has demonstrated the efficacy of this approach. Procedural complexity, however, has limited its use. The development of simpler techniques, including MammoSite® balloon brachytherapy, which uses only one catheter, and 3-D conformal external beam radiation, which eliminates an



Every effort has been made to create a comfortable, patient-focused experience at the Seattle CyberKnife Center at Swedish Medical Center.

additional invasive procedure, has expanded the available options and generated considerable interest in partial breast irradiation.

The new Swedish study is expected to show the benefits of using CyberKnife for partial breast irradiation to include: fewer technical limitations, more convenient treatment schedules, better accuracy, and a lower risk of toxicity due to smaller volumes of healthy breast and surrounding tissue and bone structure receiving high doses of radiation. The prospect of a shorter treatment regimen and the opportunity to return more quickly to normal daily activities is giving women renewed hope, and may make CyberKnife the treatment option of choice for many early-stage breast cancer patients. ☞

Seattle CyberKnife Center at Swedish Medical Center

To consult on a patient, or to learn more about CyberKnife treatment or this study, please call 206-320-7130 or visit our new Web site at www.seattlecyberknife.com

Case Report: CyberKnife Treatment for Breast Cancer

By Sandra Vermeulen, M.D.

Co-Director, Seattle CyberKnife Center

Amy is a 44-year-old female who had a screening mammogram in March of this year that showed a new density in the upper outer quadrant of the left breast. An MRI confirmed this lesion to be the only suspicious mass in either breast. An ultrasound core biopsy was consistent with an infiltrating ductal carcinoma.

Surgery

On April 15 the patient underwent a partial mastectomy and left axillary sentinel node dissection. Final pathology revealed a 0.8-centimeter, high-grade tumor with a Bloom-Richardson score of 8/9. No vascular/lymphatic space invasion was identified. Minimal ductal carcinoma in situ of high nuclear grade without necrosis was present. Surgical margins were free of both the invasive and noninvasive disease components. The infiltrating tumor was ER/PR negative and HER2/Neu 2+ positive for over expression. There was no evidence of disease metastases in the two sentinel lymph nodes that were removed.

Radiation options

I met Amy to discuss radiation options for local disease control shortly after her surgery while she was still undecided about chemotherapy. I explained the current standard of care, which includes 6½ weeks of daily radiation to the involved breast, as well as the accepted risks of side effects. In response, Amy explained she wanted cutting-edge treatments that promised high local control with reduced risk.

I also told her about using a linear accelerator for 3D-conformal external beam radiation therapy and that it would require a 25-millimeter volume to ensure accurate coverage of the 10-millimeter volume. This extra volume covers day-to-day variations in set up and corrects for target motion due to breathing during treatment.

I also explained that CyberKnife treatment of early-stage breast cancer patients was a very new treatment option — in fact she would be one of the first three breast-cancer patients treated in the United States with CyberKnife. With 1-mm accuracy, the treatment volume could be reduced from 25 millimeters to about 12-13 millimeters. Reducing the volume would decrease the risk of side effects by reducing radiation coverage of normal tissue within the high-dose volume.

I explained to Amy that we had written a treatment protocol that had been peer approved by the CyberKnife Society, but we had not yet performed this treatment. Amy decided on CyberKnife treatment.

Radiation treatment

For one week in June, Amy received CyberKnife treatment to her partial breast at the Seattle CyberKnife Center at Swedish Medical Center. Treatments that were approximately 60 minutes long were delivered once a day for five consecutive days. She felt great during and immediately after treatment and experienced no side effects. She was able to resume her normal activities after each treatment.

I saw Amy in follow up one month after treatment. She has experienced no skin changes or lymphedema. She was very happy with her decision to be treated with the CyberKnife. ☺



Sandra Vermeulen, M.D.

About the author

Radiation oncologist Sandra Vermeulen, M.D., is co-director of the Seattle CyberKnife® Center at Swedish Medical Center and a nationally recognized expert in CyberKnife Stereotactic Radiosurgery. Vermeulen received her medical degree and completed her residency in radiation medicine at Loma Linda University School of Medicine in California. She is board certified in therapeutic radiation. Her research interest includes CyberKnife treatment for early-stage breast cancer and the potential for using CyberKnife to treat atrial fibrillation.

Amy's Story: The CyberKnife option was music to her ears

Breast cancer — for many women those are two of the most feared words in the English language. For Amy, knowing her grandmother had died of untreated breast cancer meant the disease was part of her history, but it never weighed heavily on her mind. She routinely scheduled annual mammograms and periodically performed breast self-exams. Every year she was rewarded with reassuring results from her doctor and went on with her busy life as a music producer.

This year was different. Her routine mammogram triggered a four-month, high-speed medical journey.

Just two weeks after her screening mammogram, Amy was sitting in a medical office at the Cherry Hill Campus of Swedish Medical Center listening to a doctor tell her she needed a biopsy. The lump, which was detected on the mammogram and confirmed by the ultrasound, was very small — so small that even the well-trained, sensitive fingers of several physicians could not detect it.

All Amy remembers of the call she received the day after her biopsy was hearing the word “unfortunately.” The remainder of the conversation was a blur as she was already wondering, “What do I do next?”

Throughout the next several months, Amy had one guiding principle. She was determined her surgery and post-surgical treatment would be the most effective and the least invasive. Along the way, she asked each of her physicians to embrace that principle.

“The goal with any breast cancer surgery is to balance what is medically appropriate with the patient’s desire to conserve her breast,” says Patricia Dawson, M.D., Amy’s surgeon at Swedish Medical Center. “In Amy’s case, the size of the cancer relative to the size of her breast, as well as its location and Amy’s overall medical history, worked to her benefit. I was able to remove the cancer and obtain clear margins without leaving a significant cavity that would contribute to a visually deformed breast.”

Discovering a genetic predisposition

Shortly after her surgery, genetic testing provided Amy much more information about her

familial risk factors. Growing up, she had known very little about her father’s mother who had died of breast cancer. The genetic test results provided proof that Amy was positive for the BRCA1 gene, a gene mutation that significantly increases a woman’s risk of breast cancer. The BRCA1 and BRCA2 genes are commonly found in women of Ashkanazic Jewish heritage, such as Amy and her grandmother. Because her grandmother only had male offspring, awareness of abnormal BRCA1 and BRCA2 genes skipped a generation.

The next step in Amy’s medical journey was to meet with Sandra Vermeulen, M.D., a radiation oncologist at Swedish and co-director of the Seattle CyberKnife Center at Swedish Medical Center. Vermeulen discussed conventional radiation therapy options, as well as newer options that would be in keeping with Amy’s most-effective, least-intrusive guiding principle.

Because CyberKnife is such a new treatment option for breast cancer, Vermeulen offered to write a letter to Amy’s insurance company advocating for the use of this new technology. Within two days she had received approval. About a month after a second surgery to clean up the margins and place gold fiducials, Amy was ready to begin her five days of CyberKnife treatment at the Seattle CyberKnife Center at Swedish.

“I am so grateful CyberKnife was available and Dr. Vermeulen was willing to make me one of the first beneficiaries of this new technology,” says Amy. “I had none of the side effects of regular radiation. No super-sensitive skin. No burning. My heart rate and blood pressure were super low. I never felt tired. And, I still have all of my really thick hair.”

Although Amy’s medical journey has not ended, she retains a positive outlook. Her ongoing treatment includes intravenous Vitamin C and Herceptin, a relatively new drug that targets cells in early-stage HER2 tumors. As she takes each step, she is reminded of the value of researching treatments and finding doctors who will work closely with you and listen to your goals. ☺

Neuroradiology technology and expertise: the imaging behind the diagnosis

More than 30 different customized MRI protocols help define the breadth of diagnostic neuroradiology expertise available at the Cherry Hill campus of Swedish Medical Center. With two 3-Tesla and one 1.5-Tesla magnets available, neuroradiology imaging at Swedish/Cherry Hill is the most technologically advanced MRI service in the Northwest.

The five board-certified, fellowship-trained, Radia® P.S. neuroradiologists at Swedish/Cherry Hill support referring physicians throughout the state — and beyond — by providing diagnostic imaging studies for adults and pediatric patients of any age and disease complexity. Integrated with the neurosurgical excellence of the Swedish Neuroscience Institute, these physicians see a significant number of patients with primary brain tumors, multiple sclerosis and epilepsy, as well as acute and chronic stroke patients.

“We have nearly 900 stroke admissions per year and an equal number of similarly acute patients who often require prompt evaluation for urgent or emergent treatment,” says **William Likosky, M.D.**, medical director, Stroke Program, Swedish Neuroscience Institute, Swedish Medical Center. “Our successful patient outcomes are due in large part to our investment in imaging infrastructure and the availability of subspecialty neuroradiologists with whom we can consult.”

All facets of advanced neuroimaging, including perfusion MRI,

functional MRI, diffusion tensor imaging, cerebrospinal fluid (CSF) flow studies and MRI spectroscopy, are fully supported by neuroradiology at Swedish/Cherry Hill. Advanced subspecialty imaging in cardiac and musculoskeletal (orthopedic) MRI and CT is performed daily.

For more information about Swedish/Cherry Hill MRI services or to schedule a patient, please call 206-860-6517 or fax patient information to 206-320-3755. ☎

About the authors

Bart P. Keogh, M.D., Ph.D., a Radia neuroradiologist with the Swedish Neuroscience Institute, is medical director of radiology at the Cherry Hill campus of Swedish Medical Center. Keogh received his medical degree and doctoral degree in cell and molecular biology from the University of Pennsylvania School of Medicine in Philadelphia.

Dawn Hastreiter, M.D., Ph.D., a Radia musculoskeletal radiologist, is assistant medical director of radiology at the Cherry Hill campus of Swedish Medical Center. Hastreiter received her medical degree from Harvard Medical School in Boston and a doctoral degree in bioengineering from the Massachusetts Institute of Technology in Cambridge, Mass.

About Radia, Inc.

Radia's board-certified physicians provide professional services in diagnostic imaging, interventional radiology, and vascular testing and surgery for multiple hospital-based and free-standing outpatient centers throughout Washington state. For more information about Radia, visit www.radia.net.

CASE REPORTS

By **Bart Keogh, M.D., Ph.D.**, and **Dawn Hastreiter, M.D., Ph.D.**

Case Report 1: Neuroradiology

Clinical History: Evolving left-sided VIIth nerve palsy with a history of acute lymphocytic leukemia (currently in remission)

T2-weighted (*Figure 1a*) and post contrast T1-fat-saturated (*Figure 1b*) images show an approximately 2-cm probable, extra-axial, enhancing mass involving the left lateral temporal lobe. Standard anatomic imaging supported a differential diagnosis of meningioma, abscess, metastasis, lymphoma, glioma and chloroma.

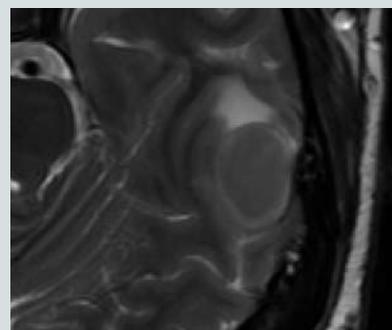


Figure 1a. T2-weighted MRI image



Figure 1b. T1-fat-saturated MRI image

As part of the presurgical work up, additional imaging, including functional MRI for language lateralization, was performed (*Figures 2a and 2b, top of opposite page*). To provide more complete characterization, spectroscopy, diffusion tensor and perfusion sequences were performed (*Figures 3a and 3b, top of opposite page*). Based upon this additional imaging, a pre-operative diagnosis of chloroma (myeloid sarcoma) was made, which was verified on histopathology after surgical resection. ☎

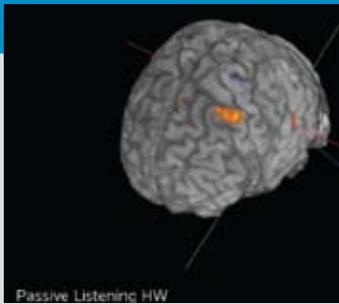


Figure 2a. Functional MRI lateralization of cortical language function showing Wernicke's area.

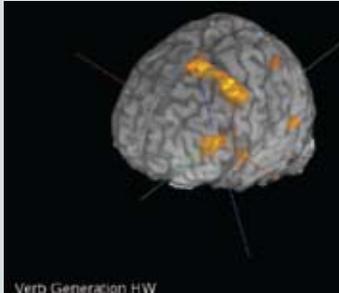
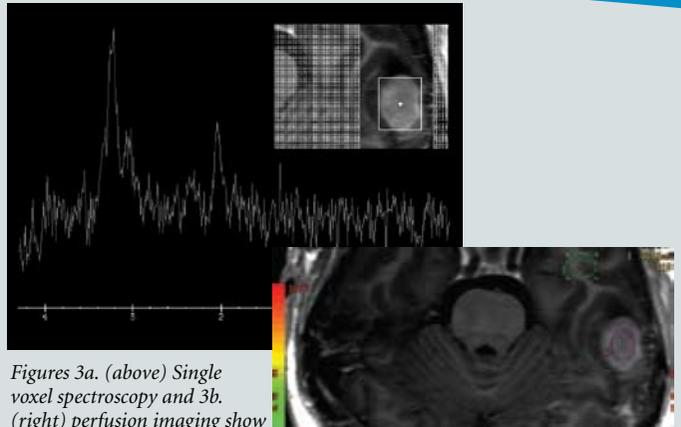


Figure 2b. Functional MRI lateralization of cortical language function showing Broca's area.

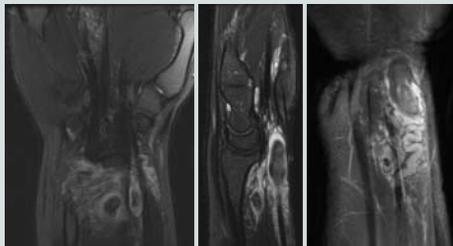


Figures 3a. (above) Single voxel spectroscopy and 3b. (right) perfusion imaging show markedly elevated choline with low normalized cerebral blood volume (0.8).

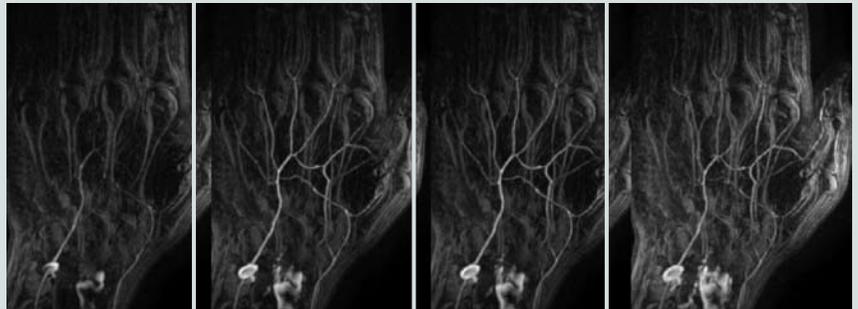
Case Report 2: Musculoskeletal

Clinical History: Wrist mass

Vascular malformations of the extremities have traditionally been difficult to characterize by noninvasive imaging due to lengthy imaging times. Figures 1a and 1b are T2-weighted fat-suppressed sequences that demonstrate serpiginous vascular structures in the wrist and hand. Figure 1c demonstrates the lesions with traditional



Figures 1a, 1b, 1c (left to right)



Figures 1d, 1e, 1f, 1g (left to right)

T1-weighted fat-suppressed imaging after administration of intravenous gadolinium contrast (depicting a delayed venous phase based on imaging time). Figures 1d-1g demonstrate the use of the TRICKS angiographic sequence on a General Electric 3-Tesla MRI machine to depict

the early arterial, late arterial, early venous and standard venous phases of contrast enhancement. This method mimics invasive angiographic studies and demonstrates in this case that the lesion in the wrist has arterial and venous components. ☞

Case Report 3. Cardiac Imaging

Clinical History: Hemochromatosis

Cardiac dysfunction associated with iron overload within the myocardium can be definitively assessed with cardiac MRI, providing the most quantitative evaluation of cardiac function. Myocardial iron load, a predictor of clinical course, may be quantitatively assessed by measuring the $R2^*$ ($1/T2^*$ relaxation time). The $T2^*$ relaxation time reflects spin-dephasing that includes contributions from local field inhomogeneity caused by iron.

Two single images from multiphase cardiac T2-weighted imaging at end-diastole (Figure 1a) and end-systole (Figure 1b) demonstrate severely diminished cardiac contractility. Ejection fraction was measured as 15%. $T2^*$ -weighted sequences acquired at multiple echo times (Figure 2) provide a measure of iron load, with $R2^*$ measured as 59 seconds (-1) (normal 36 seconds [-1]) indicating left ventricular myocardial iron overload. Iron overload is thought to cause injury related to free-radical production. ☞

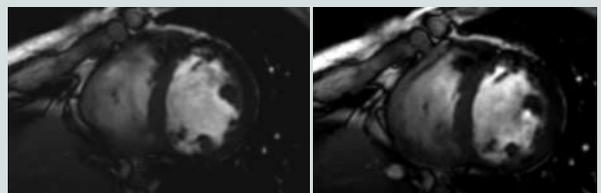


Figure 1a. (left) Single short-axis T2-weighted image at end-diastole. Figure 1b. (right) Single short-axis T2-weighted image at end-systole.

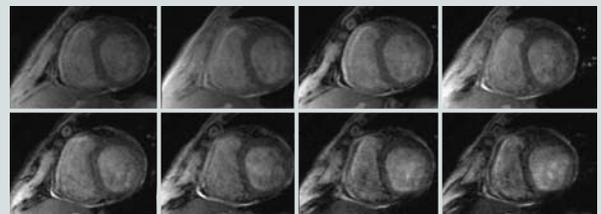


Figure 2. Single short axis $T2^*$ -weighted images at multiple echo times (1.7-12msec).

Translating patients' end-of-life preferences into physician orders

By John H. Vassall, M.D., Chief Medical Officer, Swedish Medical Center

What began as a robust debate about health-system reform has, in some quarters, taken an unfortunate turn — creating a nearly toxic environment around the topic of end-of-life planning. Taking this important aspect of health care out of context, while misrepresenting its goals and ignoring its benefits, does a great disservice to our patients.

Advance directives have existed for many years as a means of ensuring patients' treatment decisions are honored whenever they are unable to speak for themselves. Physicians and hospitals routinely ask patients if they have these documents available and often include them in the patient's medical records. It is also a common-sense practice for physicians, especially family medicine and internal medicine physicians, to periodically discuss these wishes with all of their patients (not just seniors). This type of communication during a routine office visit builds trust and helps avoid possible misunderstanding during more stressful times.

Patient preferences supported by law

Advance directives are legal documents governed by federal and state law. The Patient Self-Determination Act (a federal law in effect since 1991) requires health-care facilities that receive Medicaid and Medicare funds to inform patients of their rights to execute advance directives. All 50 states and the District of Columbia

have laws recognizing the use of advance directives, and many states also have laws honoring out-of-state advance directives.

Translating preferences into physician orders

In the early 1990s medical ethics experts in Oregon began an initiative to create a new communication tool that would improve the quality of care patients receive at the end of life. The resulting document, Physician Orders for Life-Sustaining Treatment (POLST), which was launched in Oregon in 1995, summarizes the patient's wishes and carries the weight of a physician's orders.

The POLST, which is intended for any patient with advanced life-limiting illnesses, includes the patient's specific wishes regarding cardiopulmonary resuscitation, medical interventions (comfort measures, limited interventions or full treatment), the use of antibiotics and the administration of artificial nutrition. The purpose is to translate those wishes into physician orders that move from one care setting to another. The POLST we physicians sign becomes our promise that we will respect and honor our patients' wishes. The patient and physician (or advanced practice nurse or physician assistant) complete and sign the POLST. The signed document becomes part of the medical record and is meant to be available at every level of care.

Washington was an early advocate of the POLST. The Washington Department of Health saw it as a significant improvement over the

existing DNR form and adopted the POLST statewide in 2000. Washington's Natural Death Act, Informed Consent and Durable Power of Attorney statutes allow patients, their surrogates and providers to use POLST. The Washington State (continued on A7)



John H. Vassall, M.D.

Each state regulates the use of advance directives. The following information reflects Washington State's laws and regulations.

POLST (Physician Orders for Life Sustaining Treatment)

The POLST summarizes the patient's preferences for life-sustaining treatment and translates those wishes into physician orders. The POLST is intended for patients with advanced life-limiting illnesses.

Health Care Directive/Living Will

A health-care directive or living will is a legal document that only becomes effective when the patient is terminally ill and life-sustaining treatment would artificially prolong the process of dying, or if the patient is in an irreversible coma with no reasonable hope of recovery. A health-care directive or living will describes the patient's preferences for end-of-life medical care.

Durable Power of Attorney for Health Care

A durable power of attorney for health-care is a legal document that allows the patient to name a person as his or her health-care agent. The agent is authorized to speak on behalf of the patient, and to consent to, stop or refuse medical treatment at any time a physician determines the patient cannot make necessary medical decisions, not only at the end of life.

For more information about Washington's advance directives policies, go to www.doh.wa.gov/livingwill. For information about POLST or to order POLST forms, go to www.polst.org.

Translating preferences

(continued from A6)

Medical Association oversees and facilitates the state's POLST program and provides resources and training for physicians, as well as access to patient materials.

The Department of Health established the Washington State Living Will Registry as a secure repository for patients to record their living wills, durable powers of attorney and POLST forms. Authorized health-care personnel may access these documents to facilitate treatment.

Honoring our patients' wishes

The information contained in a patient's advance directives and POLST is as important as if a conversation between the patient and his or her physician were taking place at the time of treatment. These documents are vital patient-provider communication tools that focus attention on the needs and wishes of the most important person in the health-care equation — the patient. ☞

CME Course Listings

November — December 2009

Physicians from across the region and around the world come to Swedish Medical Center's Continuing Medical Education (CME) courses to learn about new research and innovative treatment techniques.

For times and locations, go to www.swedish.org/cme or call 206-386-2755.

23rd Annual Roland D. Pinkham Basic Science Lectureship — Normal Neurobiology of Memory and Cognition

Friday, Nov. 13

Local and national experts will discuss the molecular biology of learning and memory, the aging brain, PTSD and Alzheimer's disease, cell biology of long-term memory formation, memory reconsolidation, as well as the function of sleep in relation to memory.

Diabetes Management Update 2009

Friday, Nov. 20

This conference will provide attendees an update on diabetes management, including insulin and medication management, screening for pre-diabetes, and treatment of under-insured, unemployed and homeless patients. Other discussions will focus on renal disease, depression, nutrition, immunizations and foot care as they relate to the diabetic patient.

Swedish Medical Center is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

Swedish Medical Center

Founded in 1910, Swedish Medical Center is the largest, most comprehensive, nonprofit health-care provider in the Seattle area. Based in Seattle, Swedish is comprised of four medical facility campuses (Ballard, Cherry Hill, First Hill and Issaquah), Swedish Visiting Nurse Services and Swedish Physicians — a network of 13 primary-care clinics. In addition to general medical and surgical care, Swedish is known as a regional referral center, providing specialized treatment in areas such as cardiac care, oncology, orthopedics, high-risk obstetrics, neurological care, pediatrics, organ transplantation and clinical research. For more information, visit www.swedish.org or call 800-SWEDISH (800-793-3474).

Ballard

5300 Tallman Ave. N.W.
Seattle, WA 98107-3985
206-782-2700

Cherry Hill

500 17th Ave.
Seattle, WA 98122-5711
206-320-2000

First Hill

747 Broadway
Seattle, WA 98122-4307
206-386-6000

Issaquah

2005 N.W. Sammamish Rd.
Issaquah, WA 98027-5364
425-394-0600

Swedish Visiting Nurse Services

6100 219th St. S.W., Ste. 400
Mountlake Terrace, WA 98043
425-778-2400

Swedish Physician Division

600 University St., Ste. 1200
Seattle, WA 98101-1169
206-320-2700

Save the Date

Swedish CME in 2010

Friday, Jan. 22 — *SIS Cardiology Nurse/Tech Symposium: An update on interventional cardiology and cardiovascular surgery*

Friday, Jan. 29 - *6th Annual Pediatric Specialty Update for the Primary-Care Physician*

Friday, Feb. 12 — *The Unique Needs of Women with Neurological Diseases*

Friday, Feb. 26 - *7th Annual John L. Locke, Jr., Preventative Cardiology Symposium*

Friday, April 2 — *Neuromodulation 2010: A Comprehensive Review of Non-ablative Therapies for Neurological Diseases*

Friday, May 7 — *Annual Oncology Symposium*

Thursday and Friday, May 13-14 — *Cerebrovascular Disease Symposium and Merrill P. Spencer, M.D. Endowed Lectureship*

Physician Opportunities

Are you a physician who would like to join a team-oriented, patient-focused practice?

Contact Mike Waters

Swedish Physician Recruiter
206-320-5962 (office)
206-327-2790 (cell)
mike.waters@swedish.org