

CLARITY, a stunning technique developed at Stanford, creates exquisitely detailed 3-D images of intact post-mortem brains



MESSAGE FROM THE CHAIRS OF THE STANFORD NEUROLOGY AND NEUROSURGERY DEPARTMENTS

Stanford's tremendous commitment to providing novel treatments through clinical and technological advances continues across the full spectrum of our neuroscience practice. This Neuro-Innovation issue highlights many such advances as we consistently lead in delivery of the highest quality care for our patients.

Over the past five years Stanford Neuroscience has experienced tremendous expansion, bolstered by the Bay Area's accelerating growth to over 8 million, and increasing clinical demand from regions throughout the US and Pacific Rim. Situated in the heart of Silicon Valley, Stanford is surrounded by the headquarters of thousands of high-tech companies, including 31 Fortune 1000 companies such as Facebook, Apple, eBay, Adobe, Yahoo, Hewlett-Packard, Netflix, Oracle, Pixar, and Google. Today, our Neuroscience team of 140+ faculty of neurosurgeons, neurologists, and interventional neuroradiologists cares for over 35,000 patients annually at Stanford Hospital & Clinics (up 73% since 2010), in addition to substantially increasing clinical volumes at our Lucile Packard Children's Hospital, Palo Alto Veteran's and Santa Clara County affiliates. In that time we added 40 new clinical faculty. The ongoing expansion of both Stanford Hospital & Clinics and Lucile Packard Children's Hospital, along with our forthcoming comprehensive, free-standing outpatient Stanford Neuroscience Health Center (opening early 2016—sumcrenewal.org) will provide world class, integrated patient-centered clinical environments in which such growth can continue.

Stanford Neuroscience pushes the boundaries of possibility, offering a combination of high volume clinical programs, innovative approaches and research trials found in few academic medical centers. Patients with intractable epilepsy receive the latest surgical interventions, including the recently FDA-approved NeuroPace® RNS® system, developed at Stanford. Stanford researchers invented technology known as the "Brain Stethoscope" that allows patients and caregivers to hear what is happening in the brain before, during, and after a seizure.

This issue also highlights Stanford's new innovations to restore movement. Our movement disorders program recently implanted into the first US patient a sensing neurostimulator coupled to a deep brain stimulation device. This exciting feedback device allows recording of brain signals while the patient *moves freely in the clinic*. Over time, we anticipate this neurostimulator will evolve into an autonomous "brain pacemaker," designed to actively hone its parameters to optimize treatment of each patient's unique symptoms. Stanford is also participating in a phase 3 trial utilizing high intensity focused ultrasound to treat essential tremor. Our ►

researchers are hopeful that this noninvasive treatment will yield immediate results and vastly improved lifestyles. We also recently developed the nation's first integrated data capturing and analysis system for evaluating patient outcomes after spinal surgery. These data will be used by Stanford neurosurgeons to determine which treatments are the most successful at minimizing pain, returning patients to work, and maximizing quality of life.

The most advanced treatments for exceptionally challenging autonomic diseases are available at Stanford. On April 25, 2012, our new state-of-the-art autonomic laboratory, the only one of its kind in the Western US, opened to assess these difficult to diagnose disorders. Four autonomic experts collaborate closely with Stanford specialists across multiple disciplines to evaluate and treat GI dysfunction, movement disorders, cardiovascular symptoms, sleep disorders and autonomic neuropathies.

Stanford's Pituitary Center features the latest clinical offerings in the treatment of neuroendocrine

disorders and pituitary tumors and Stanford Interventional Neuroradiology pioneers advanced techniques used in treating complex aneurysms, acute stroke, carotid stenosis, and many other vascular diseases of the brain and spine.

Notably, 2014 marks the 20th Anniversary of the first patient treated with Cyberknife, a technology invented at Stanford by Dr. John Adler. Major CyberKnife breakthroughs developed here include treatment of arteriovenous malformations, prostate cancer, and benign and malignant spinal tumors. We are also pleased to showcase our recent fusion of CyberKnife radiosurgery and 3-D angiographic imaging, which targets diverse pathologies with unmatched precision.

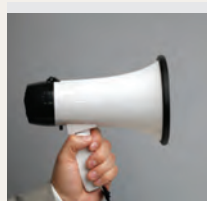
We are committed to our partnerships with referring physicians and look forward to your inquiries at **1.800.800.1551**. We welcome opportunities to collaborate on basic and translational research, clinical trials and patient care as we strive to make a positive difference in every patient's life.

Frank M. Longo, MD, PhD

*George E. and Lucy Becker Professor
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Gary K. Steinberg, MD, PhD

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FRONT COVER IMAGE: CLARITY, a stunning technique developed at Stanford, creates exquisitely detailed 3-D images of intact post-mortem brains (see *Nature video*¹). Years in the making, this approach preserves virtually every original protein and nucleic acid, without dislocation, in a *transparent* hydrogel mesh that effectively replaces a brain's *opaque* lipids. Instead of painstakingly sectioning/staining brains and puzzling them back together, normal as well as pathological conditions can now be studied in a whole brain with light and fluorescent antibody probes. Karl Deisseroth, MD, PhD, Kwanghun Chung, PhD, and colleagues, furthermore reported in *Nature*² that multiple rounds of staining/de-staining various molecular targets in the same tissue are possible without affecting structural integrity. They published spectacular and revealing colorful arrays of neuronal circuitry from the cortex to deep structures within the brain such as the thalamus, at both molecular resolution and en masse. CLARITY even works on long-preserved brain tissue and thus opens new prospects for scales and scopes of human disease studies.



Stanford University in the heart of Silicon Valley | Photo: Linda A. Cicero / Stanford News Service

Gaining Traction on Intractable Epilepsy

The Stanford Comprehensive Epilepsy Program, designated at the highest Level IV, is a world leader in the treatment of seizure disorders, including intractable epilepsy, as well as research into their causes.

Up to one-third of epilepsy patients suffer from seizures that are nonresponsive to medication. Stanford’s Intractable Epilepsy Program streamlines evaluations for these patients, offers myriad options, including better medication and management, and has the necessary technical capabilities born of Stanford and Silicon Valley innovators to select those patients who could experience life-transforming benefits from surgery.

“In our comprehensive program,” says Josef Parvizi, MD, PhD, associate professor of neurology and neurological sciences and director of the Stanford Program for Intractable Epilepsy, “we rely on state-of-the-art technology offered by the most recent advances in neuroscience at Stanford to determine the precise focus of seizures in each patient with intractable epilepsy.”

Since 1992, Lawrence Shuer, MD, professor of neurosurgery and an expert in the surgical treatment of epilepsy, has treated countless patients who have lived for years with uncontrolled seizures. “We have surgical options that can help these patients,” he says, “along with a comprehensive multidisciplinary

team of specialists who work together to determine which treatments have the best chance for success.”

To refer a patient to the Intractable Epilepsy Program please call **650.723.6469**

EPILEPSY: THE MATERNAL/CHILD CONNECTION



In addition to Drs. Robert Fisher, Martha Morrell, Kevin Graber, Josef Parvizi and Scheherazade Le, the newest specialist to join the epilepsy team is Kimford Meador, MD, professor of neurology and neurological sciences. Dr. Meador

is an expert in cognitive problems associated with epilepsy as well as the treatment of women’s issues in epilepsy—including during pregnancy. Dr. Meador has served as PI for the MONEAD (Maternal Outcomes and Neurodevelopmental Effects of Antiepileptic Drugs) study, a long running NIH multicenter study of pregnancy risks and outcomes in women with epilepsy and their children. Maternal parameters studied include seizure risk, pregnancy complications, such as c-sections, and depression ▶



Laura Koellsted

Laura Koellsted, a mother of two, suffered 5–20 seizures a day for years before coming to Stanford’s Intractable Epilepsy Program. She had lost her driver’s license and more importantly control of her life. By using cutting-edge functional and seizure mapping procedures, Dr. Parvizi and the neurosurgery team pinpointed the source of Laura’s seizures to the primary motor cortex. Despite this risky location, the source’s discrete position meant that surgery to remove the causative cells was possible. The surgery was a resounding success and Laura has the driver’s license to prove it.

during and after pregnancy. Outcomes in children include cognitive and behavioral neurodevelopment, gestational size, and effects of breast-feeding when maternal antiepileptic drugs are present.

Stanford is actively recruiting participants for this study. For more information contact Dr. Meador at **650.725.6648** ■



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October 31 – November 1, 2014

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For more information visit: cme.stanford.edu/neuro

Brain Stethoscope



Josef Parvizi



Chris Chafe

Josef Parvizi, MD, PhD, and Chris Chafe, PhD, director of the Center for Computer Research in Music and Acoustics (CCRMA) at Stanford University, have forged a unique collaboration to create a device to “hear” brain waves. This venture is possible because of a seed grant from Stanford’s Bio-X Interdisciplinary Initiatives

Program (Bio-X IIP), which funds innovative interdisciplinary projects with the potential to improve human health. Drs. Parvizi and Chafe call their powerful tool the “Brain Stethoscope.”

Still in the early stages of development, this amazing musification of brain signals will allow patients, clinicians and caregivers to hear what is happening in the brain before, during and after a seizure. Read more about the Brain Stethoscope in the [Stanford Report](#)¹. A sample EEG recording can be heard on [YouTube](#)².



MRgFUS team: (left to right): Maria Colburn, BA, Jaimie Henderson, MD, Rachelle Bitton, PhD, Pejman Ghanouni, MD, PhD, Kim Butts Pauly, PhD, Ricardo Valenzuela, PhD

Medically Refractory Essential Tremor Phase III Clinical Trial

“Six patients have been treated at Stanford with minimally invasive transcranial magnetic resonance guided high intensity focused ultrasound (MRgFUS) for essential tremor,” says Pejman Ghanouni, MD, PhD, assistant professor of radiology and Principal Investigator at Stanford. The in-progress multicenter, randomized, double-blind Phase III trial will enroll 72 patients total at up to 8 sites.

Essential tremor (ET) is defined as tremor during purposeful movement such as writing, holding a glass to drink, shaving, or buttoning a shirt. It occurs most often in the head and hands but may also affect other extremities, the larynx and trunk. ET is caused not by disease but by abnormalities in areas of the brain that control movement. This is a disabling condition that affects quality of life, sometimes for decades. The United States is estimated to have 5 million people with ET, the highest incidence occurring in those over 60 years of age.

Collaboration with referring physicians is crucial for the identification of qualified study participants, as patients often learn to live with ET symptoms that affect everyday skills such as eating, drinking, writing, dressing and driving. Many become isolated from

social activities and even stop seeing their doctors or taking medication. “The physical appearance



of a tremor might not be reflected by degradation in quality of life,” says Rosalind Chuang, MD, clinical assistant professor of neurology and

neurological sciences, and consulting neurologist on the study. Dr. Chuang tracks and evaluates the patients, and coordinates care with referring physicians. She is optimistic about the immediate benefits of this study’s noninvasive treatment for ET.

A strict inclusion criterion for medically refractory essential tremor includes the failure of available medications to control symptoms. Patients should have persistent symptoms despite having tried traditional medication protocols. Here failure is defined by the ineffectiveness or intolerance of medication or the inability to reach sufficient dosage.

Candidate patients for deep brain stimulation who would prefer a noninvasive technique to ablate the cause of their ET may also be eligible to participate. This placebo-controlled study has patients randomized 3:1 for treatment versus sham. ▶

All patients will be unblinded 3 months after treatment, with actual treatment being offered to those in the sham group. Patients will be tracked during the year after treatment to determine the durability of their responses. (See NCT01827904 at clinicaltrials.gov for more information.)

While ultrasound has been applied medically otherwise for decades, its recent coupling with high resolution transcranial magnetic resonance imaging (MRI) creates highly accurate depictions of targets, for planning purposes and immediate post-treatment verification of ablation. MRI also provides real-time high resolution imagery that, during treatment, shows changes in a target's temperature and confirms the target's ablation. The patient is awake during treatment, allowing the neurosurgeon to conduct neurological testing to assess tremor resolution.

Focused ultrasound can be used in tumor ablation or on other targets in the brain in a tightly directed manner that spares surrounding tissue. It provides immediate localized thermal coagulation and can be reapplied if indicated. Clinical applications include neuropathic pain management, tumor ablation and may lead to improved treatments for Parkinson's disease, intractable epilepsy, stroke and obsessive-compulsive disorder.



Kim Butts Pauly, PhD, professor of radiology and director of the Center for Biomedical Imaging, investigates the delivery of neurotherapeutics

across the blood-brain barrier using MRgFUS.¹

Advances in magnetic resonance (MR) thermometry from her lab over the past decade greatly improved both accuracy and quality of images, reducing artifacts along with errors due to respiratory motion as well as other repetitive and nonrepetitive motions.

The MRgFUS procedure is performed at a specialized imaging facility at Stanford and features a uniquely designed helmet that ensures patient safety by circulating chilled water to cool the skull. An initial

computerized tomography scan determines skull thickness at 1000 different points. Mapping and imaging methods such as this, developed in Dr. Butts Pauly's lab along with others, allow MRI to accurately localize the ultrasound. A stereotactic frame, specially modified for the procedure, is used to position the patient.

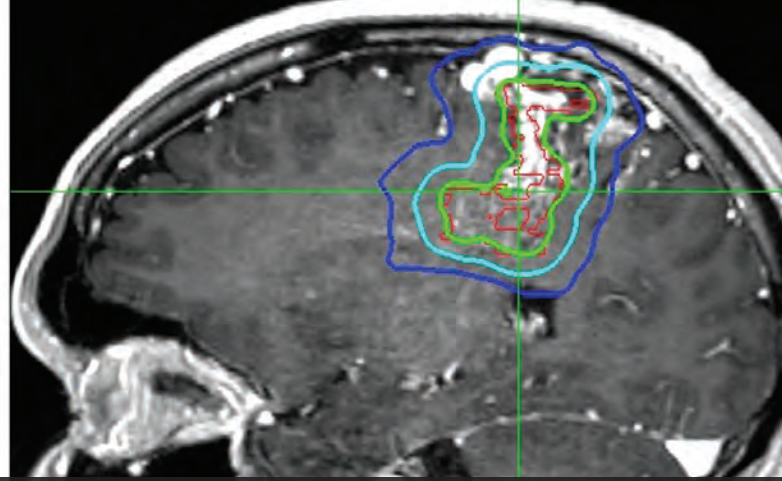
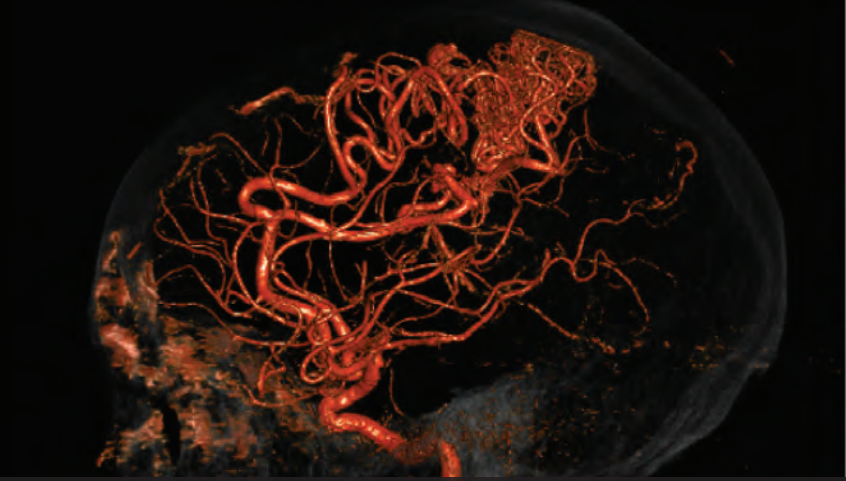


Jaimie Henderson, MD and Pejman Ghanouni, MD, PhD

Targeting and treatment are performed collaboratively by Dr. Ghanouni and Jaimie Henderson, MD, the John and Jene Blume—Robert and Ruth Halperin Professor of Neurosurgery. To confirm the target location before actual treatment, several low-power sonications (below the ablation temperature threshold) are applied. During the procedure, precisely monitored higher-power sonications (up to 60°C) are guided by MR thermometry to ensure accurately targeted coagulation.

Patients are kept overnight for observation and are able to return home the next day to resume normal activities. Whereas the MRgFUS technique has already shown success when applied to uterine fibroids and bone metastases, its novel application to ET as outlined here holds great promise for neuroscience. All 15 patients with severe medically refractory essential tremor in a recent pilot study improved after undergoing [transcranial MRI-guided focused ultrasound thalamotomy](#).² ■

To refer a patient to the present study, or to consult with Dr. Chuang about a patient, please call Ricardo Valenzuela, Clinical Trial Coordinator, at **650.725.6930**.



Left: 3-D fusion diagnostic showing AVM. **Right:** Visual of CyberKnife treatment plan.

20 Years of CyberKnife: Advances, Current Trends and Future Applications

Stanford invented CyberKnife technology and continues to lead the field, having treated over 6,500 patients, more than any other single program in the world. The year 2014 marks the 20th anniversary of the world's first robotic image-guided radiosurgery treatment that used a CyberKnife, in prototype form. This procedure was first performed at Stanford in June 1994 behind the leadership and innovative ideas of Dr. John Adler. Since the mid-1990s medical centers and their patients worldwide have benefitted from Stanford's expertise in CyberKnife neuro-applications. As co-directors of the CyberKnife program for the past 14 years, Steven Chang, MD, professor of neurosurgery and the Robert C. and Jeanette Powell Neuroscience Professor, and Iris Gibbs, MD, associate professor of radiation oncology, have spearheaded a dramatic expansion of applications for the CyberKnife and are foremost in the development of new treatment strategies based on rigorous review of dosimetrics and outcomes.

Stanford has advanced state of the art target planning for CyberKnife radiosurgery by combining 3-D rotational angiography and traditional target planning in the catheterization laboratory. Dr. Chang recently reported in *Neurosurgery*¹ this combination's advantages over the lone use of magnetic resonance imaging (MRI) and computed tomography (CT) scans when treating brain arteriovenous malformations (AVMs). In the article, Dr. Chang, and colleagues compare the volumetric accuracy of fused MRI and CT scans versus fused MRI, CT and 3-D angiography in 30 AVM patients. They show

that 3-D rotational angiography combined with MRI/CT scans visualizes AVMs with unmatched precision.

When used in CyberKnife radiosurgery this triad increases obliteration success rates. Stanford is the pioneer and world leader of radiosurgery use in treating spinal AVMs. In collaboration with Michael Marks, MD, chief of interventional neuroradiology, professor of radiology and neurosurgery, and Robert Dodd, MD, PhD, assistant professor of neurosurgery and radiology, successful implementation of the aforementioned important advance in angiographic imaging allows clinicians to treat myriad complex cases that require exquisite radiographic resolution. Such collaborative advancements have fostered treatment refinements. "We are the only radiosurgery center in the United States that is actively treating spinal cord AVMs," says Dr. Chang. "Our radiosurgical experience, as well as our cutting-edge equipment, allow us to work on these challenging lesions."

Originally focused on brain pathology, today the CyberKnife is effective in ablating intracranial and extracranial tumors both cancerous and noncancerous everywhere in the body, from the brain and spine to the liver and prostate. Skull base tumors, including those in pituitary glands, and excruciating disorders such as trigeminal neuralgia are notably responsive to CyberKnife treatment. Recent major breakthroughs developed at Stanford include successes with benign and malignant spinal tumors as well as prostate cancer. ▶

The CyberKnife prostate cancer program is being expanded under the direction of Mark Buyyounouski, MD. These exciting applications evolve quickly as data accumulate. “We are proud of our legacy, yet know that greater frontiers remain,” says Dr. Gibbs. “As the field of robotic radiosurgery matures it is ever more important to continue the extension of concepts founded in this extraordinary technology and to create new possibilities for our patients.”



Steven Chang, MD and Iris Gibbs, MD, co-directors of the CyberKnife Program

As a noninvasive painless alternative to surgery, CyberKnife’s frameless robotic system delivers self-guided beams of high-dose radiation with submillimeter accuracy. The entire process from patient referral to treatment is extremely quick. One benefit to nonlocal patients is that target planning scans can be performed in the morning and analyzed the same day. The patient has free time to visit local sites while a computer rapidly fuses 240 slices from MRI/CT scans and medical physicists perform volumetric calculations to determine exact treatment parameters. Two decades ago these analyses were nearly impossible and a decade ago they took hours. Today they take 15 minutes. When the patient returns to the clinic the following day, doctors upload the treatment parameters to the CyberKnife, which will accommodate patient movement but is otherwise completely preprogrammed. In contrast to surgery, all of the hard work occurs behind the scenes beforehand—the patient simply arrives and lays on the table, and the doctor hits “start.” This expeditious and painless treatment goes a long way toward relieving patient stress in circumstances that are often very difficult. The CyberKnife also offers a significant advantage to patients with cancer metastasis. Radiation and chemotherapy can now be simultaneous, so there are

no weeks-to-months-long interruptions of systemic care or scheduling challenges with referring oncologists. As innovators of multiple CyberKnife protocols, physicians at Stanford also optimized the treatment of acoustic neuromas by developing a 3-day fractionated regimen that has significantly improved the rates of hearing preservation. After the work’s 2011 publication in *Neurosurgery*² many centers in the US have adopted this protocol. Stanford’s extensive experience is exemplified by the fact that approximately half of our acoustic neuroma patients come from out of state.

FUTURE APPLICATIONS EXPLORED AT STANFORD

- Back pain from facet syndrome, typically treated with epidural injections. A pilot series knocked out nerve fibers and reduced back pain.³
- Treatment of refractory depression and obsessive-compulsive disorder by using radiation to modulate the brain circuits.
- Treatment of epilepsy with either a higher radiation dose to ablate the source of seizure activity or a lower dose to cause a modulatory effect.
- Neuromodulation might mitigate seizures by changing the brain’s wiring without damaging tissue.

The next frontier of CyberKnife radiosurgery will further combine ongoing advances in technology with our continually improving comprehension of biology in order to optimally individualize treatment interventions. ■

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Radiation Oncology

The Evolution in Endovascular Treatment of Hemorrhagic and Ischemic Stroke

Interventional Neuroradiology, led by Michael Marks, MD, professor of radiology, with Dr. Huy Do, professor of radiology, and Dr. Robert Dodd, assistant professor of neurosurgery and radiology, pioneers minimally-invasive endovascular techniques to treat complex aneurysms, acute stroke, cerebrovascular stenosis and other vascular diseases of the brain and spine. From the early use of platinum coiling through the latest iterations of embolization devices, the group continues to innovate.

Aneurysms, a leading cause of hemorrhagic stroke, were originally treated invasively with open neurosurgery. Less invasive endovascular approaches, initially only for otherwise-untreatable and difficult to access aneurysms, have evolved into primary treatment tools. Studies show that patients with ruptured aneurysms treated with coiling often do better than those treated with traditional surgery. Coiling was first developed to treat smaller ruptured aneurysms, however, as it became more widely used, limitations emerged. In cases of larger aneurysms with wider necks, the risk of coil prolapse into the vessel and lack of durability precluded coiling's use. Consequently, inflatable balloons and stent devices were developed to treat these previously-untreatable aneurysms.

In 2012, Stanford became the first center in Northern California to use the Pipeline™ Embolization Device to treat the largest and most complex aneurysms. This wire mesh device, placed across the neck of an aneurysm, diverts blood flow and induces thrombosis. Using the latest 3-D imaging and flat panel detector technology, Dr. Marks and his team precisely aim the embolization device onto the vessel wall. This is vital, as any blood seepage will interfere with the aneurysm's ability to heal. The team can subsequently return with a balloon assist or a wire/microcatheter to repair any leakage.

To reduce the risk of stroke, we treat every patient who receives this new embolization device with

antiplatelet medication until the aneurysm closes and the vessel heals. While other centers use a set dosage of antiplatelet medications, Stanford tailors each patient's dosage by the results of specialized laboratory tests in order to reduce complications from endovascular procedures. Of the approximately 40 patients treated with the device during the last year, no major post-treatment thromboembolic or hemorrhagic strokes occurred.

Stanford is one of the centers in the US that regularly participates in new device testing. ▶

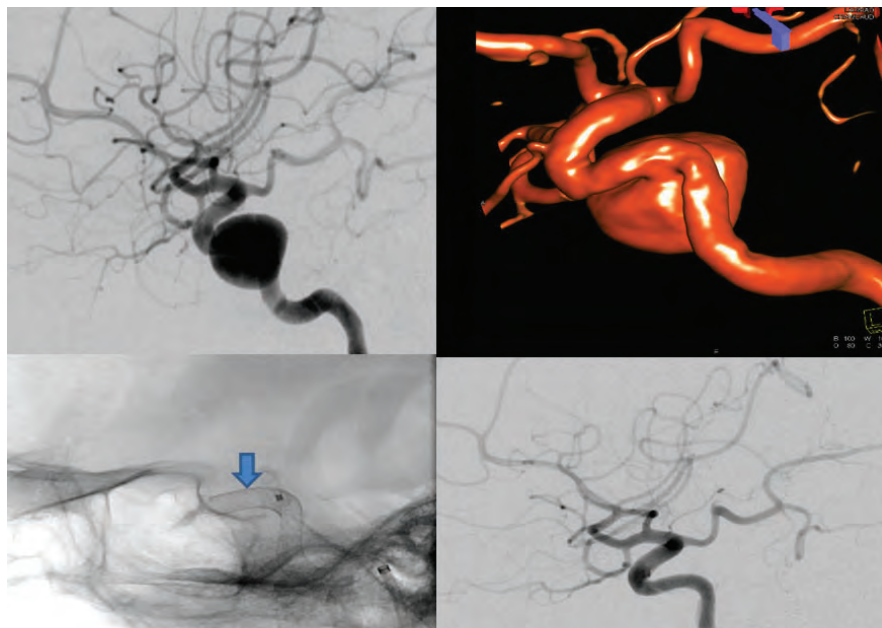


Figure 1. 47-year-old patient with ophthalmoplegia and a large cavernous aneurysm. **Upper left:** Conventional angiographic picture of the aneurysm. **Upper right:** 3-D image reconstructed from the rotational angiogram. **Lower left:** The flow diverting device (blue arrow) has been placed. **Lower right:** The conventional angiogram 6 months later after the aneurysm has thrombosed.

This leading-edge clinical approach, says Marks, “has driven the development of devices that treat ischemic stroke by opening up blood vessels of patients who aren’t responsive to IV-tPA or can’t receive tPA.” Stanford is among the first to test the Merci™—a novel device approved to open blood vessels in acute stroke. The stentriever is an even newer device that greatly enhances the ability of

stroke centers with endovascular capability to open vessels in acute stroke. Stanford was 1 of 17 centers nationally to test the first stentriever approved for use in the US, and last year became the first center in Northern California to put these devices into regular clinical use.

Interventional Neuroradiology works in close collaboration with Cerebrovascular Neurosurgery, led by Chairman Gary Steinberg, MD, PhD and Stroke Neurology, led by Greg Albers, MD, who, together with Marks, co-founded the Stanford Stroke Center, which today includes 15 stroke neurologists, neurosurgeons and interventional neuroradiologists. Within this interdisciplinary model, a full range of treatments is considered before any recommendation is made. This collaboration extends to recent advances in stroke imaging. “Our multidisciplinary team continues to develop and evaluate imaging protocols that have greatly advanced our treatment of stroke patients,” says Dr. Marks. One example, the DEFUSE 2¹ study, directed by Dr. Albers, demonstrated the potential of endovascular reperfusion during acute stroke to improve clinical outcomes in patients who had a target mismatch MRI profile, which suggested that salvageable tissue was present. Says Marks, “our plans for the DEFUSE 3 trial intend to prove that endovascular therapy provides favorable clinical outcomes for patients with particular MRI profiles who need treatment beyond the 3 to 4.5 hour stroke window.” ■

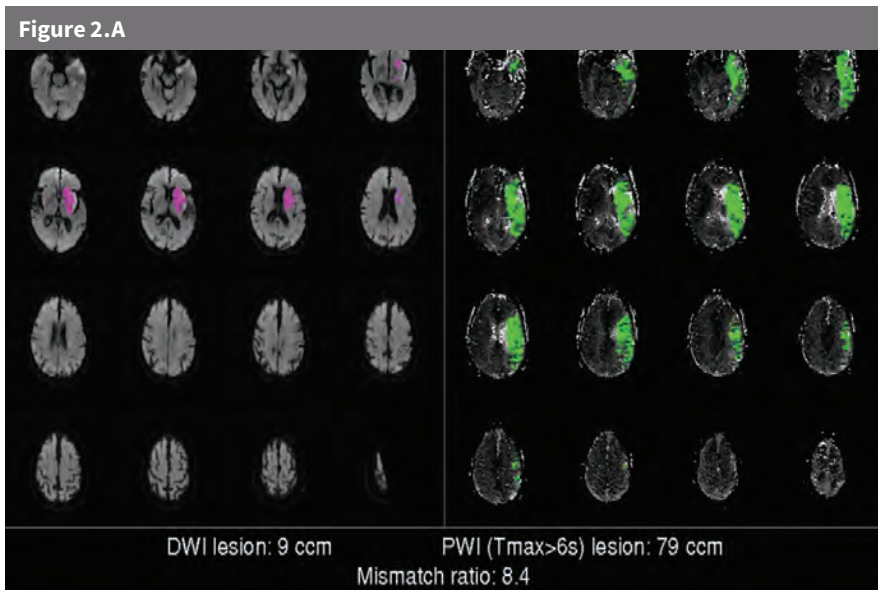


Figure 2. 82-year-old patient arrived unable to speak or move her right arm and leg. IVtPA therapy was given, with no improvement noted. Multimodal MRI was performed, and the pattern detected indicated candidacy for endovascular therapy. She had a small area of infarcted brain (DWI-Fig. 2.A) and a large area of brain at risk for further infarction (PWI-Fig. 2.A). She was taken to the catheter lab where an occlusion of the left carotid artery was discovered (Fig. 2.B). Endovascular devices re-opened the artery in approximately half an hour (Fig. 2.C). Further imaging indicated that the infarcted area was contained with no subsequent tissue damage. The patient left the hospital under her own power and resumed her previous activities.



Stanford Stroke Center: The **Nation's**
First Joint Commission-Certified
Comprehensive Stroke Center.

To refer a patient to the Interventional Neuroradiology group, or for a consult, please call **650.723.0358**

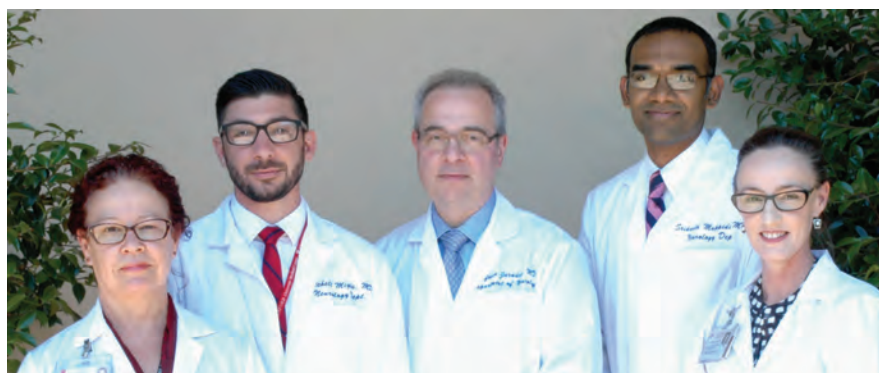
Autonomic Lab Ushers in New Era of Diagnosis for Autonomic Disorders

Medical director of Stanford's Autonomic Disorders Program, Safwan Jaradeh, MD, professor of neurology and neurological sciences, and his team are often referred some of the most challenging patients. Board certified in autonomic disorders, neurology, clinical neurophysiology and electrodiagnostic medicine, Dr. Jaradeh is among just 150 or so physicians globally who specialize in the treatment of these disorders. Investigating clues such as light-headedness, heat intolerance, sweating changes, digestive issues, urinary issues, and difficulty remaining upright, Dr. Jaradeh applies his unparalleled experience in clinical testing to accurately diagnose very complex and debilitating, yet often treatable, diseases.

Spearheaded by Dr. Jaradeh, Stanford's state-of-the-art autonomic laboratory opened April 25, 2012, as the only active and dedicated one of its kind in the Western United States, one of just five in the nation, and the only Program on the West Coast that evaluates adults and children. The autonomic team has also welcomed Srikanth Muppidi, MD, a board certified specialist in autonomic and neuromuscular disorders, and Mitch Miglis, MD, an expert in autonomic and sleep disorders. This fall, Veronica Santini, MD, a movement disorders and autonomic specialist, will join the team. By the end of its first and shorter year, 100 patients had undergone full evaluation and testing in the lab. Today 16 to 18 new patients are evaluated each week. When the [Stanford Neuroscience Health Center](#)¹ opens in early 2016,

these numbers will increase with the addition of a second dedicated autonomic lab on site that includes thermoregulation sweat test (TST) capabilities.

Patients at the autonomic disorders laboratory typically undergo a combination of 4 tests—Q-Sweat, Valsava, tilt-table and deep breathing—which last approximately 1.5 hours total. During the latter 3 tests patients undergo continuous blood pressure monitoring that produces constant, beat-by-beat blood pressure data. Occasionally, video EEG



Autonomic team (left to right): Cynthia Feakins, NSN, NP-C, Mitchell Miglis, MD, Safwan Jaradeh, MD, Srikanth Muppidi, MD, Lori Fong, PT

can add a simultaneous diagnostic advantage for patients with unclear cause of syncope or seizures, and to diagnose convulsive syncope. The overlap of autoimmune and multiple other disorders requires a vast skill set and an integrated approach to correctly diagnose and treat patients. Stanford specialists in neuromuscular disorders, movement disorders, endocrinology, cardiology, gastroenterology and rheumatology work closely with the autonomic team and routinely refer patients for further testing. Movement disorder clinicians might notice autonomic impairment in patients with Parkinson's disease and recommend autonomic studies to differentiate autonomic impairment associated with Parkinson's disease from other Parkinson's syndromes, such as the more rare autonomic and movement disorder Multiple System Atrophy/Shy-Drager Syndrome. Cardiologists who see patients with syncope and tachycardia may suspect



A patient undergoing simultaneous tilt-table and EEG testing in the new autonomic laboratory

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Cutting Edge Treatment of Pituitary Disorders

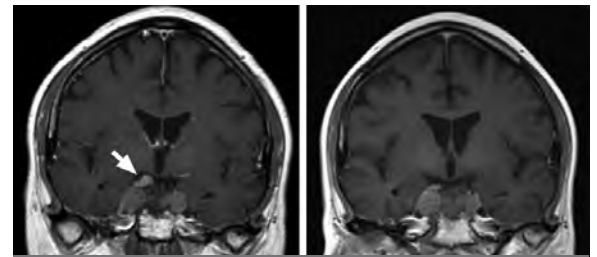


Laurence Katznelson, MD, serves as medical director of the Stanford Pituitary Center. Composed of an interdisciplinary team of endocrinologists, neurosurgeons, radiologists, specialized nurse practitioners and physician scientists, the Center offers streamlined evaluations, education, and comprehensive, compassionate treatment for patients with neuroendocrine disorders and pituitary tumors.

“We are incredibly fortunate to be able to draw on the rich intellectual resources here at Stanford,” says Dr. Katznelson, “that foster the innovative strategies necessary to manage these often extremely complex and disabling disorders.” An interesting recent case highlights the dramatic clinical improvements Dr. Katznelson and the Center’s team are able to provide. A 55-year-old woman was diagnosed with Cushing’s disease at age 16 and underwent bilateral adrenalectomy. She subsequently developed Nelson’s syndrome, a potentially life-threatening complication consisting of aggressive growth of the corticotroph adenoma, hyperpigmentation and rising serum adrenocorticotrophic hormone (ACTH) levels.

Over the years, she endured multiple neurosurgeries and radiotherapy to address pituitary tumor growth. When she arrived at Stanford with ocular pain and third cranial nerve palsy, she was found to have a hemorrhagic suprasellar tumor. After reviewing therapeutic options with Dr. Katznelson, the patient chose to enroll in the Novartis D2203 trial in May 2011. As part of this study, she was treated with a novel somatostatin analog, pasireotide long-acting release (LAR). At baseline, her plasma ACTH was elevated from normal levels of 5–27 pg/mL to 42,710 pg/mL. Following treatment with pasireotide, her ACTH values decreased rapidly and remained stable through 20 months of study follow-up. The reduced ACTH was accompanied by a profound reduction in skin hyperpigmentation. In fact, her skin became largely hypopigmented with multiple lentigines. A follow-up MRI at 9 months showed progressive reduction in the size

of the right-sided/suprasellar component of the tumor. The rest of the MRI scan was stable. At 19 months, there was further reduction of the mass. The third cranial nerve palsy did not improve during treatment and the patient developed hyperglycemia, a known complication of the medication, but she otherwise experienced only mild, self-limited adverse reactions, such as gastrointestinal upset. Her improved quality of life is evident in her enthusiastic endorsement of her treatment when she returns to Stanford to speak with medical students interested in pituitary endocrinology.



Left: MRI scan showing the area of suprasellar enlargement (arrow). **Right:** Repeat MRI after 19 months of pasireotide treatment.

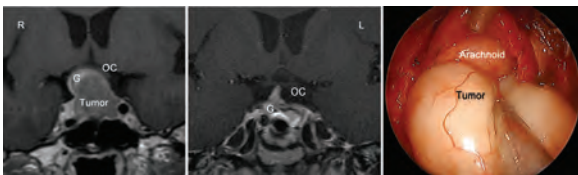
Few medical treatments target the corticotroph adenoma in patients with Nelson’s syndrome. Thus an unmet need exists for improvement in signs and symptoms, reduction of ACTH levels and control of tumor growth. The availability of a specialized center with access to novel agents was the key to this patient’s dramatic improvement in biochemical and clinical markers after administration of pasireotide and offers hope for patients with Nelson’s syndrome.¹

Patients are referred to the Center for a wide range of pituitary and endocrine disorders, including prolactinomas, Cushing’s syndrome, acromegaly, nonfunctioning pituitary tumors, growth hormone disorders as well as disorders of the hypothalamic-pituitary region that lead to adrenal, thyroid, ovarian or testicular deficiencies.

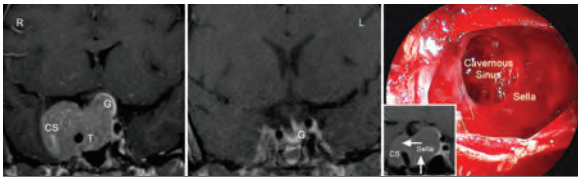


Griff Harsh IV, MD, surgical director of the pituitary center, describes the Center as a collaborative effort to provide innovative patient-focused

multidisciplinary care. “As a high volume, specialized center,” he notes that, “we can offer expertise across a wide range of multimodal therapies, including endoscopic and microscopic surgical resection, CyberKnife, intensity modulated radiation therapy (IMRT), and all supporting aspects of patient care.” Team-based care of patients treated by minimally invasive endoscopic surgery is managed jointly by a neurosurgeon, rhinologic surgeon, endocrinologist, and their nursing colleagues. This permits successful treatment of particularly challenging cases, such as large tumors compressing the optic chiasm to cause visual loss (Case 1) and invading the cavernous sinus to cause double vision (Case 2).



Case 1: Pituitary Adenoma. Pre-Op MRI: Tumor (T) pushes gland (G) up and to right, compressing optic chiasm (OC), causing visual loss. Post-Op MRI shows tumor removed, stalk and gland preserved. Intra-op Photo: Tumor removed from sella and beneath optic chiasm; gland preserved and arachnoid intact.



Case 2: Pituitary Adenoma. Pre-Op MRI: Tumor (T) pushes gland (G) up and to left and invades the right cavernous sinus (CS), causing R III palsy and diplopia. Post-Op MRI: Tumor resected, stalk and gland preserved; R III palsy and diplopia resolved. Intra-Op Photo: Tumor removed from sella and right cavernous sinus.

In addition to neurosurgical and clinical care services for pituitary and neuroendocrine disorders, the Center provides neuroendocrine testing, neuroophthalmology and radiology specialists, ongoing clinical trials for innovative pituitary disease treatments, radiation oncology research and treatment, and patient education. ■

Autonomic Lab continued ▶

autonomic failure and refer their patients to the Program. Diseases such as Postural Orthostatic Tachycardia Syndrome (POTS), prominent but often misdiagnosed in young people, are treatable if properly diagnosed. Rare diseases such as Autoimmune Autonomic Ganglionopathy (AAG) are, again, treatable when properly diagnosed.

Another unique focus at Stanford is the interplay of sleep and autonomic dysfunction. Many patients with fragmented sleep and frequent awakenings, regardless of the underlying cause, may develop high blood pressure and other symptoms of autonomic dysfunction. Many patients with Parkinson’s syndromes and autonomic dysfunction also have REM-Behavior Disorder, a potentially dangerous but very treatable condition where patients involuntarily act out their dreams and sometimes seriously injure themselves or their bed partners.

“The overlap between these conditions is considerable and often overlooked,” says Dr. Miglis. “Many patients with autonomic disorders suffer from unrefreshing or fragmented sleep. Conversely, many patients with sleep disorders have symptoms of autonomic dysfunction. If we can improve a patient’s sleep, their daytime symptoms may also improve.”

More information on how sleep disorders may contribute to hypertension and autonomic dysfunction, as well as other articles written by Stanford sleep physicians for patients, can be found on huffingtonpost.com.²

Dr. Miglis actively recruits patients with POTS who are interested in participating in a project that examines the role of sleep disorders in this syndrome. Interested clinicians are encouraged to contact Dr. Miglis at mmiglis@stanford.edu. The autonomics team works closely with specialists in multiple disciplines at Stanford as well as nationwide. To refer a patient to the autonomic disorders clinic, or to consult with Drs. Jaradeh, Muppidi, or Miglis please call **650.723.6469** ■

The Brain Pacemaker

Helen Bronte-Stewart, MD, MSE, neurologist, physicist and engineer, epitomizes the scientific pursuit to link quantitative data and qualitative observations. When she established the Motor Control and Balance Laboratory at Stanford over 13 years ago, little was known about how brain signals affect movement.

Now, in an equipment-for-data collaboration with Medtronic Inc, she is one of the first to test a therapeutic innovation for patients with such disorders: a sensing neurostimulator coupled to an implanted deep brain stimulation (DBS) device. This feedback device allows her team to record real-time brain signals and quantitative kinematic measures as a patient *moves freely in the clinic*. These real-time data help physicians and ultimately the device itself, independently, finely tune electrical parameters to optimize patients' movements, minimize side effects and prolong the battery life. This is "the next step toward the demand brain pacemaker," says Dr. Bronte-Stewart, the John E. Cahill Family Professor of Neurology and Neuroscience.

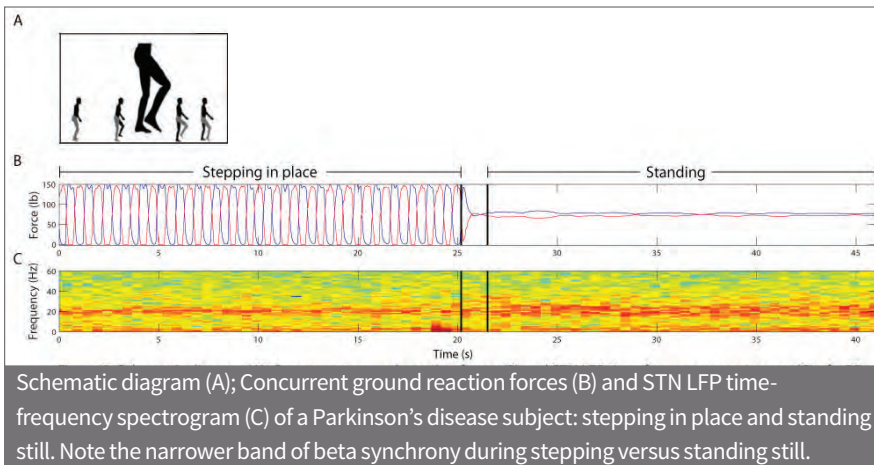
"We use electrophysiology speak to characterize rhythms and electrical profiles of voltage, pulse width and frequency, which mean to us milligrams of a drug or dosing frequencies," she adds. "But it's just electronic and not in pill form. For us the central question is how can we refine and optimize DBS if we can't record and quantify the electrical output responses or signals that are altered by the DBS device?"



Affectionately known to colleagues as the "data monster," Dr. Bronte-Stewart has for more than a decade produced answers. The first step was to establish quantitative metrics that identify the unique characteristics of movement disorders. Her groundbreaking study in 2000 showed that the cardinal signs of Parkinson's disease, bradykinesia, temporal abnormalities, variability, freezing behavior and tremor, could be tracked using a MIDI computer-interfaced keyboard. Her lab has now engineered a keyboard with a finer resolution in the measurement of timing, velocity, pressure, and position of finger movements.

Dr. Bronte-Stewart has also used computerized dynamic posturography (CDP) to quantify different aspects of balance in people with movement disorders. This is a significant advance over subjective clinical rating scales. Using CDP her team has developed the first metric of freezing-of-gait in Parkinson's disease and has shown that even when patients' feet seem "frozen" their brains nonetheless send alternating weight-shifting signals to their feet, though not strong enough to actually lift them. Her measurements of limb movement revealed that finger movement data sufficiently reflected all other symptoms. In patients undergoing DBS, she and colleague Jaimie Henderson, MD, the John and Jene Blume — Robert and Ruth Halperin Professor of Neurosurgery and director of stereotactic and functional neurosurgery, routinely use her finger-tracking keyboard in the operating room as a diagnostic tool. This new brain signal sensing device

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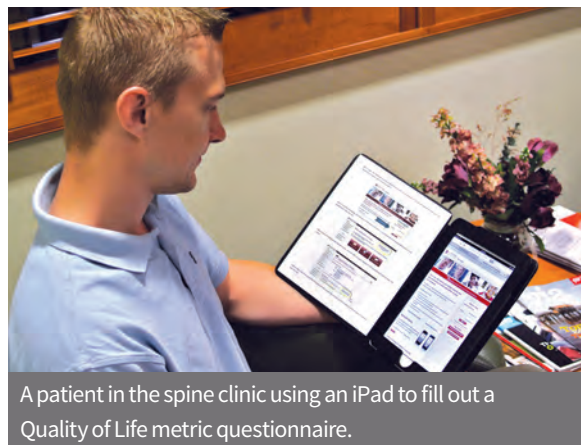


Quality of Life after Spine Surgery: Data Integration = Improved Outcomes

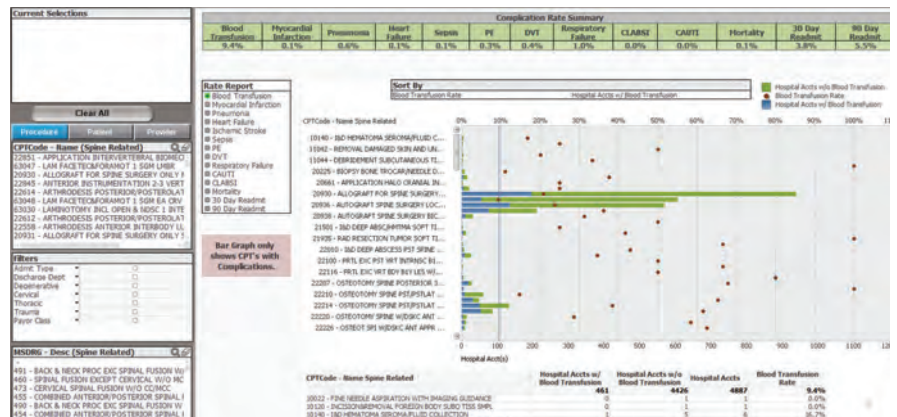
Imagine a patient sitting in the spine clinic, for the first of several pre-scheduled follow-up visits after spine surgery, typing on an iPad. The patient is filling out a questionnaire, choosing from possible answers such as, “I can do as much work as I want,” “my sleep is moderately disturbed,” or “the pain is very mild at the moment.” Each question is carefully constructed to provide quantitative metrics of patient-perceived outcomes. Each answer is routed directly into discrete fields of the patient’s electronic medical record (EMR) where built-in algorithms, capable of crunching numbers based on multiple criteria, track the patient’s recovery over time.

Stanford Spine Center’s new integrated EMR database in EPIC does just that. This idea was proposed two years ago by Dr. John Ratliff, associate professor of neurosurgery and co-director of the Stanford Neurosurgery Spine Program. He envisioned a single framework that would become a routine way to capture and quantify all patient data, both pre- and post-operatively, from the patient’s perspective. This framework would help determine which patients benefit the most from surgery, which patients experience the best long-term outcomes for a given procedure, and which post-surgical interventions are most beneficial.

It’s an approach to spine care unlike any other in the US. Several major centers collect patient data in parallel database systems, one contains EMR of all routine patient data such as blood pressure



A patient in the spine clinic using an iPad to fill out a Quality of Life metric questionnaire.



Quality of life, procedure, comorbid condition, hospital, and other variables are organized into a dashboard that allows follow-up of outcomes measures and of patient progress over time, ensuring the best possible patient outcomes after treatment.

and temperature readings, and the other contains outcome data that is entered and analyzed separately. Although used with some success over the past 5-6 years, this dual system of data collection is inefficient, rife with redundancies and error prone.

Stanford’s new integrated data-capturing and analysis system became a reality through the collaborative efforts of neurosurgical physicians and advanced practice providers, new patient coordinators, information technologists, programmers and database experts. The Patient Health Questionnaire-9 (PHQ-9) (depression screening), Oswestry Disability Index (ODI) and Neck Disability Index (NDI) (disability) are built directly into EPIC and accessed by patients through their MyHealth portal. Physicians now access the dashboard to view patient data based on criteria such as complication rates, length of hospital stays, trends, pain and patient satisfaction.

Collecting this information directly from spine patients is now a routine part of their care. The moment patients are scheduled for surgery follow-up dates are flagged at 3, 6 and 12 months post-surgery. At these time-points patients automatically receive an emailed questionnaire to be filled out and returned or alternatively complete it at their follow-up visit using an iPad. While this fundamental shift

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NEUROLOGY

AUTONOMIC DISORDERS



Srikanth Muppidi, MD

Clinical Assistant Professor of Neurology and Neurological Sciences

Dr. Muppidi specializes in the testing, diagnosis and clinical care of autonomic and neuromuscular disorders. His clinical interests include neuropathies, autonomic disorders and Myasthenia Gravis. His research interests include treatment and outcome measures in Myasthenia Gravis, detecting early autonomic impairment in diabetes and the diagnosis and management of immune/neurodegenerative causes of autonomic failure.

EPILEPSY



Kimford Meador, MD

Professor of Neurology and Neurological Sciences and Director of the Epilepsy Monitoring Unit

Dr. Meador specializes in cognitive disorders and women's issues in epilepsy. His research interests include cognitive mechanisms, cerebral lateralization, pharmacology and physiology of cognition, mechanisms of perception, consciousness and memory, EEG, epilepsy, epilepsy and pregnancy, preoperative evaluation for epilepsy surgery, intracarotid amobarbital procedure, functional imaging, therapeutic drug trials, neurodevelopmental effects of antiepileptic drugs, psychoimmunology, behavioral disorders, and neuropsychiatric disorders. Dr. Meador has been PI for over a decade on the MONEAD clinical trial, an NIH multi-center study of pregnancy outcomes in epilepsy that is now open for enrollment at Stanford.

HEADACHE



Nada Hindiye, MD

Clinical Assistant Professor of Neurology and Neurological Sciences

Dr. Hindiye is an adult neurologist who specializes in headache and facial pain disorders. She is currently investigating a diagnostic screening protocol for chronic migraine. Her other research interests include the use of transcranial magnetic brain stimulation in the treatment of headache disorders as well as understanding the pathophysiology and investigating novel treatment options for migraine and other headache disorders.

HOSPITALIST



Katie Kvam, MD

Clinical Assistant Professor of Neurology and Neurological Sciences (As of August 1, 2014)

Dr. Kvam specializes in the care of adult inpatients with acute neurological issues. She provides care for a wide variety of hospitalized patients with neurologic disease and has a particular interest in transitions of care, patient-provider communication and interprofessional education. Her research interests include encephalitis, health care utilization and cost of care.



Nirali Vora, MD

Clinical Assistant Professor of Neurology and Neurological Sciences

Dr. Vora provides comprehensive care to stroke patients and hospitalized adults with acute or undiagnosed neurological issues. She specializes in vascular disorders including TIA, vasculitis, dissection, venous thrombosis, and undetermined or "cryptogenic" causes of stroke. She leads the Stanford Global Health Neurology program, through which she started the first stroke unit in Zimbabwe and gained experience in HIV neurology. Additional research interests include stroke prevention, eliminating disparities in stroke care, and global neurology education.

MEMORY DISORDERS



Sharon Sha, MD

Clinical Assistant Professor of Neurology and Neurological Sciences

Dr. Sha's clinical expertise includes Alzheimer's disease, frontotemporal dementia, Lewy Body disease, corticobasal syndrome, progressive supranuclear palsy, Huntington's disease, ataxia, multiple system atrophy, and other dementias. Dr. Sha also conducts clinical trials in order to identify disease modifying treatments for dementia. She has a special interest in genetic forms of dementia and the cognitive impairment in parkinsonian-related disorders.

MOVEMENT DISORDERS



Veronica Santini, MD

Clinical Assistant Professor of Neurology and Neuroscience (As of October 1, 2014)

Dr. Santini is a board-certified neurologist who specializes in the diagnosis and management of movement disorders including Parkinson's disease, Huntington's disease, dystonia, tic disorder, tremor, and ataxia. She also has a special interest in autonomic dysfunction. She takes a holistic approach to patient care and is proficient in the use of DBS and Botox. She is passionate about global health and educating as well.

MULTIPLE SCLEROSIS



Alexandra Goodyear, MD, MS

Assistant Professor of Neurology and Neurological Sciences and Medical Director of the Neuroscience Clinical Trials Group

Dr. Goodyear specializes in clinical care and quality of life for MS patients. She has served as a Principal Investigator on multiple MS studies, and is committed to providing the opportunity for all MS patients to participate in research, including CIS, RRMS, SPMS and PPMS. Her research interests include neuromyelitis optica, cost effectiveness and epidemiology.

NEUROMUSCULAR DISORDERS



Joanna Dearlove, MD, MPH

Clinical Assistant Professor of Neurology and Neurological Sciences

Dr. Dearlove specializes in both pediatric and adult neuromuscular disorders. Her research interests include neuromuscular medicine, in particular diseases of muscles such as dystrophinopathies, congenital muscular dystrophies and myopathies.



Sarada Sakamuri, MD

Clinical Assistant Professor of Neurology and Neurological Sciences (As of September 1, 2014)

Dr. Sakamuri specializes in both neuromuscular disorders and general neurology. Her research interests include respiratory dysfunction in ALS and community outreach for neuromuscular disorders. She has enjoyed teaching opportunities at medical schools in the United States and Poland.

NEURO-ONCOLOGY



Reena Thomas, MD, PhD

Clinical Assistant Professor of Neurology and Neurological Sciences (As of September 1, 2014)

Dr. Thomas specializes in the treatment of oncologic disorders of the central nervous system. Her research interests include neuro-oncology, imaging of glioblastoma, and immunotherapy of glioblastoma.

STANFORD CENTER FOR SLEEP SCIENCES AND MEDICINE



Juliane Winkelmann, MD

Professor of Neurology and Neuroscience, Member of Stanford Center for Sleep Sciences and Medicine

Dr. Winkelmann was assistant medical director at the Max-Planck Institute of Psychiatry and at the Department of Neurology, Technische Universität München, Germany. She headed the movement disorder unit and a specialized outpatient clinic for restless legs syndrome (RLS) patients and also led the Research Group Neurogenetics at the Institute of Human Genetics at the Helmholtz Zentrum München, Germany.

Her lab at Stanford seeks to fully characterize the genetics of RLS, use RLS as a model to study gene-environment interactions in human populations, establish an RLS rodent disease model, and develop new treatments.

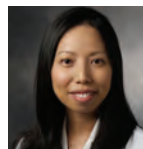
TIA/STROKE



Kara Flavin, MD

Clinical Assistant Professor, Physical Medicine & Rehabilitation Division, Departments of Orthopaedic Surgery and Neurology and Neurological Sciences

Dr. Flavin is an expert in the comprehensive treatment and rehabilitation of neurologic disorders, including stroke, spinal cord injuries, spasticity management, and nerve and muscle disorders. Her research interests include pressure ulcer treatment and prevention, as well as improving functional recovery after neurologic injury.



Amy Tai, MD

Clinical Assistant Professor of Neurology and Neurological Sciences

Dr. Tai specializes in the use of blood biomarkers and perfusion imaging for rapid assessment of stroke. She is also evaluating the use of simulation stroke codes for resident training. Her current work in stroke and TIA care includes quality improvement and cost savings analysis at the Clinical Excellence Research Center and designing a new healthcare delivery model in a multi-disciplinary team.

NEUROSURGERY



E.J. Chichilnisky, MD

Professor of Neurosurgery

Professor Chichilnisky's lab studies how the retina encodes, processes and transmits visual information to the brain. His unique focus on the circuitry and function of the primate retina uses novel large-scale multi-electrode recordings and quantitative analysis of light responses to probe the function of the retinal circuitry with unprecedented resolution. He also seeks to reveal fundamental principles of circuitry and computation relevant to

other neural structures, and is working to translate his findings about retinal function into the design of visual prostheses to treat blindness from retinal degeneration.



Bohdan Chopko, MD

Clinical Associate Professor of Neurosurgery

Dr. Chopko practices neurosurgery at the Stanford-St. Rose Dominican Hospitals/ Dignity Health facilities (St. Rose-Siena and San Martin Hospitals) in Henderson, Nevada. His clinical and research interests include endovascular techniques and therapeutics, cerebrovascular disease, minimally invasive spine procedures and neurooncology.



Atman Desai, MB.BChir.

Clinical Assistant Professor of Neurosurgery (As of September 1, 2014)

Dr. Desai specializes in minimally invasive surgical treatment of complex spinal conditions including tumors, degenerative spine diseases, and spinal traumas and deformities. His current research focuses on processes that lead to superior outcomes in neurosurgery, disparities in neurosurgical care, development of predictive models of neurosurgical outcomes, and cost effectiveness and comparative effectiveness studies of neurosurgical disorders.



Melanie Hayden Gephart, MD, MAS

Assistant Professor of Neurosurgery

Dr. Hayden Gephart's clinical practice focuses on the treatment of patients with tumors of the central nervous system. This surgical specialization complements her laboratory in translational neuro-oncology, which strives to understand the underlying mechanisms of brain tumor development and to develop novel therapeutics for primary and metastatic brain tumors. Dr. Hayden Gephart's basic science research and degree in clinical research enable her to bridge the divide from lab discovery to innovative therapy.



Jamshid Ghajar, MD, PhD
Clinical Professor of Neurosurgery

Dr. Ghajar is a foremost expert in traumatic brain injury. At Stanford he is director of the Stanford Concussion and Brain Trauma Center. He has served as President of the Brain Trauma Foundation since 1995 and was previously Chief of Neurosurgery at The Jamaica Hospital-Cornell Trauma Center in New York from 1989–2014. He has received multiple patents for brain neurosurgical tools and cognitive assessment devices. He is a leading grantee and advisor for the Department of Defense.



Casey Halpern, MD
Assistant Professor of Neurosurgery
(As of September 1, 2014)

Dr. Halpern received his neurosurgical training at the University of Pennsylvania. His specialty is the treatment of functional disorders, including movement disorders, epilepsy, chronic pain, and spine disease. He is particularly interested in developing clinical trials that expand indications for deep brain stimulation (DBS). Dr. Halpern’s laboratory research investigates the therapeutic role of DBS that targets the brain’s reward circuitry. His studies could lead to a better understanding and possible treatment for relapse behavior common to many neurologic and psychiatric conditions, and even obesity.



Josh Levin, MD
Clinical Assistant Professor, Physical Medicine & Rehabilitation Division, Departments of Orthopaedic Surgery and Neurosurgery

Dr. Levin is a triple board certified physiatrist who specializes in the diagnosis and non-surgical treatment of spine disorders. He is a part of Stanford’s growing comprehensive spine team, and his practice includes interventional spine procedures and EMG. His research interests include evaluating subsets of patients

who may benefit from percutaneous treatments of the facet joints, evaluation of novel objective outcome measures in the treatment of spine and musculoskeletal disorders, and investigating treatment options for discogenic pain.



Jessica Little, PhD
Clinical Assistant Professor of Neurosurgery

Dr. Little is a clinical psychologist with an extensive background in international and multi-site research. As director of Clinical Research and Operations at the newly-formed Stanford Concussion and Brain Trauma Center she is working to prioritize interdisciplinary research collaboration at Stanford and to develop an infrastructure for large-scale, evidence-based clinical trials. Her current research focuses on mild traumatic brain injury and the intersection of neuromotor technology and cognitive assessment.



Peter Tass, MD, PhD
Consulting Professor of Neurosurgery

Professor Tass is a computational neuroscientist with extensive translational experience. He directs the Institute of Neuroscience and Medicine-Neuromodulation (INM-7) at Jülich Research Center (Germany) and developed FDA and CE mark approved Medtech stimulation devices. His approach aims at unlearning abnormal synaptic connectivity and, hence, inducing long-lasting therapeutic effects. He has joined the department of neurosurgery as a consulting professor working primarily in the area of neuromodulation for the treatment of tinnitus, Parkinson’s disease, epilepsy, and pain.

The Brain Pacemaker continued ▶

is exciting for both what it can reveal and where it can be utilized. It links quantitative brain signals to Dr. Bronte-Stewart’s metrics for tremor, bradykinesia and freezing of gait by sensitively and instantaneously reporting a patient’s response to a physician’s tweaks of a pacemaker’s voltage. Diseases can be diagnosed more precisely and detected earlier than before. And this device works not only in the OR but, perhaps more importantly, also in the less intense and more versatile environment of the clinical laboratory.

This innovation will surely evolve into an autonomous brain pacemaker. Compared with cardiology advances in the 1960s, Dr. Bronte-Stewart adds, “when you talk about a cardiac pacemaker you don’t know the settings, you just know it works because *it* does the job.” She envisions that “over time the device will self-correct its parameters for specific symptoms because of the work we and others are doing to understand brain signals and which aspect of the disease they are corresponding to.”

Soon these parameters may uniquely target movement disorders such as bradykinesia, freezing of gait, and tremor, and eventually other neuropsychiatric diseases such as obsessive-compulsive disorder, intractable depression and possibly Alzheimer’s disease. Dr. Bronte-Stewart “can imagine five to ten years from now students and postdocs will say, ‘really there was a day when you couldn’t read off the brain signals from the pacemaker? That’s weird!’” ■

For questions about the following clinical trials please contact our clinical trials research coordinator Maria Coburn at **650.736.9551** or **mcoburn@stanford.edu**

NEUROSURGERY

A Phase I/IIA Study of the Safety and Efficacy of Modified Bone Marrow Stromal Cells (SB623) in Patients with Stable Ischemic Stroke

The primary purpose of the clinical study is to determine the safety of a modified stem cell SB623 when administered to chronic, stable ischemic stroke patients. A second purpose is to determine whether SB623 might improve stroke symptoms. Chronic, stable ischemic stroke patients must be between 6 and 60 months after their stroke, and with only this one prior stroke, and with no further improvement from physical therapy.

PI: Gary K. Steinberg, MD, PhD
(NCT01287936)

Familial Intracranial Aneurysm (FIA) Study

To explore genetic and environmental factors associated with the incidence of familial intracranial aneurysms. The study continues to enroll non-familial affected patients.

PI: Gary K. Steinberg, MD, PhD
(NCT00071565)

DuraSeal Exact Spine Sealant System Post-Approval Study (DuraSeal PAS)

PI: John Ratliff, MD
(NCT01410864)

A Study of Patient Reported Outcomes after Stereotactic Radiosurgery for Trigeminal Neuralgia

PI: Scott G. Soltys, MD
(NCT01364285)

Radiosurgical Neuromodulation for Refractory Depression

Co-PIs: Hugh Brent Solvason, MD, PhD and John Adler, MD
(NCT01403441)

A Phase I Trial of Vorinostat Concurrent with Stereotactic Radiotherapy in Treatment of Brain Metastases from Non-Small Cell Lung Cancer

PI: Griff Harsh, MD
(NCT00946673)

Comparison of Overall Survival Post-CyberKnife Radiosurgery Treatment of Patients with 1-3 versus 4 or more Brain Metastases

PI: Steven D. Chang, MD;
Co-Investigators: Judith A Murovic, MD, Griffith Harsh, MD; Gordon Li, MD; Iris C. Gibbs, MD; Scott Soltys, MD; Steve Hancock, MD
(NCT01778764)

A Study of Amifostine for Prevention of Facial Numbness in Patients Receiving Stereotactic Radiosurgery for Trigeminal Neuralgia

PI: Scott Soltys, MD
(NCT01364259)

A Phase I/II Trial of Fractionated Stereotactic Radiosurgery to Treat Large Brain Metastases

To determine the optimal radiation dose for large brain metastases.

PI: Scott Soltys, MD
(NCT00928226)

Effects of Growth Hormone on Cognition and Cerebral Metabolism in Adults

To elucidate the effects of growth hormone replacement in patients with growth hormone deficiency on cognitive function using structural and functional neuroimaging and cognitive testing.

PI: Laurence Katznelson, MD
(NCT01007071)

An Open Label, Multi-Center Pasireotide Roll-Over Protocol for Patients who have Completed a Previous Novartis-sponsored Pasireotide Study and are Judged by the Investigator to Benefit from Continued Pasireotide Treatment

PI: Laurence Katznelson, MD
(NCT01794793)

An Acromegaly, Open-label, Multi-center, Safety Monitoring Program for Treating Patients with SOM230 (Pasireotide) LAR who have Need to Receive Medical Therapy (ACCESS)

PI: Laurence Katznelson, MD
(NCT01995734)

A Randomized, Double-Blind, Multicenter, Phase III Study to Evaluate the Efficacy and Safety of Pasireotide LAR in Patients with Cushing's Disease

PI: Laurence Katznelson, MD
(NCT01374906)

A Phase II Study of Rindopepimut/GM-CSF in Patients with Relapsed EGFRVIII-Positive Glioblastoma (ReACT)

To study if adding the experimental vaccine rindopepimut (CDX-110) to bevacizumab can improve progression free survival (slow the growth of tumors) in patients with relapsed EGFRVIII positive glioblastoma.

PI: Gordon Li, MD
(NCT01498328)

Progesterone for the Treatment of Traumatic Brain Injury (ProTECT III)

The ProTECT study will determine if intravenous (IV) progesterone, started within 4 hours of injury and given for a total of 96 hours, is more effective than placebo for treating victims of moderate to severe acute traumatic brain injury.

PI: Jim Quinn, MD
Sub-PI: Marco Lee, MD
(NCT00822900)

A Phase I/II Trial of Temozolomide and Hypofractionated Radiotherapy in the Treatment of Supratentorial Glioblastoma Multiforme

To determine the safety and effectiveness of 1 week versus 6 weeks of hypofractionated radiotherapy in combination with temozolomide

PI: Scott G. Soltys, MD
(NCT01120639)

The Park-Reeves Syringomyelia Research Consortium

A multi-center research effort to create a disease registry of syringomyelia and chiari I malformation to study these disorders, their natural history and clinical course.

PI: Gerald Grant, MD

Bone Flap Resorption after Cranioplasty in Children: A Multicenter Retrospective Study

A multi-center, retrospective review of pediatric cranioplasty patients to determine what risk factors play a role in infection and bone flap resorption.

PI: Gerald Grant, MD

Investigation of DTI MRI as a Correlate to Pain Relief and Facial Numbness in Patients Following Stereotactic Radiosurgical Rhizotomy for Trigeminal Neuralgia

PI: Scott Soltys, MD
(NCT01364272)

BrainGate2: Feasibility Study of an Intracortical Neural Interface System for Persons with Tetraplegia

To obtain preliminary device safety information and to demonstrate the feasibility of people with tetraplegia using the System to control a computer cursor and other assistive devices with their thoughts. Additionally to determine the participants' ability to operate communication software, such as e-mail, simply by imagining the movement of their own hand. The study is invasive and requires surgery.

PI: Jaimie Henderson, MD
(NCT00912041)

DuraSeal TM Exact Spine Sealant System Post-Approval Study

To compare DuraSeal Exact Spine Sealant with other fibrin sealants in preventing cerebrospinal fluid (CSF) leak after primary repair of Dura. Duraseal Spine Sealant is indicated for use as an adjunct to sutured dural repair during spinal surgery to provide watertight closure.

PI: Harminder Singh, MD;
Co-PIs: Marco Lee, MD, PhD; Jason Lifshutz, MD
(NCT0059403524)

NEUROLOGY

Biobank For MS And Other Demyelinating Diseases

To establish a large, longitudinal collection of high quality samples and data from subjects with MS, and selected other demyelinating diseases as a shared resource to scientists researching the causes, sub-types, and biomarkers of MS and related demyelinating diseases.

PI: Jeffrey Dunn, MD
(NCT00445367)

An International, Study of Rindopepimut/GM-CSF with Adjuvant Temozolomide in Patients with Newly Diagnosed, Surgically Resected, EGFRVIII-positive Glioblastoma (ACT IV)

PIs: Lawrence Recht, MD and Seema Nagpal, MD
(NCT01480479)

Double-Blind, Randomized, Placebo-Controlled, Phase II Safety and Efficacy Trial of MultiStem® in Adults with Ischemic Stroke

The primary objectives of this stem cell trial for acute stroke are to determine the highest well-tolerated and safest single dose of MultiStem up to a maximum of 1200 million total cells in subjects with ischemic stroke and determine the efficacy of MultiStem on functional outcome.

PI: Neil Schwartz, MD, PhD
(NCT01436487)

A Phase I/II Study of Local Field Irradiation and Temozolomide Followed by Continuous Infusion Plerixafor as an Upfront Therapy for Newly Diagnosed Glioblastoma GBM

PI: Lawrence Recht, MD
(NCT01977677)

A Study to Explore the Safety and Tolerability of Acthar in Patients with Amyotrophic Lateral Sclerosis

An 8-week randomized, open-label evaluation to examine the acute safety and tolerability of 4 Acthar dosing regimens to inform dose selection for future studies of Acthar in patients with Amyotrophic Lateral Sclerosis.

PI: Yuen So, MD, PhD
(NCT01906658)

Epilepsy Impact Scale

The investigators are developing a questionnaire to quickly measure the impact of epilepsy on a person's life and whether it increases, decreases or stays the same over time.

PI: Robert Fisher, MD, PhD
(NCT01833234)

Maternal and Neurodevelopmental Outcomes of in Utero Antiepileptic Drug (AED) Exposure (MONEAD)

To establish the relationship between antiepileptic drug exposure and outcomes in the mother and child as well as describe and explain the variability in antiepileptic drug exposure and response

PI: Kimford J. Meador, MD
(NCT01730170)

VNS Therapy Automatic Magnet Mode Outcomes Study in Epilepsy Patients Exhibiting Ictal Tachycardia (E-37)

Obtain baseline clinical outcome data (Stage 1) upon which to base a subsequent study (Stage 2) of the Model 106 VNS implantable pulse generator.

PI: Robert Fisher, MD, PhD
(NCT01846741)

Lactic Acidosis During and After Seizures

This project looks at the time course of lactic acid rise (if any) after seizures. Salivary and capillary lactic acids are tested.

PI: Robert Fisher, MD, PhD
(NCT01833247)

Vitamin D Supplementation in Multiple Sclerosis

Patients with relapsing-remitting MS will receive high-dose or low-dose oral vitamin D and glatiramer acetate. The rate of MS attacks, number of new lesions and change in brain volume on MRI will be determined.

PI: Alexandra Goodyear, MD
(NCT01490502)

A Randomized, Double-Blind, Placebo-Controlled, Parallel-Group, Dose-Ranging Study to Assess the Efficacy, Safety, Tolerability, and Pharmacokinetics of BIIB033 in Subjects with Relapsing Forms of Multiple Sclerosis when used Concurrently with Avonex

PI: Alexandra Goodyear, MD
(NCT01864148)

An Intravenous Infusion Study of rHlgM22 in Patients with Multiple Sclerosis

This Phase I, multi-center, double-blind, randomized, placebo-controlled, dose-escalation study will evaluate safety, tolerability, pharmacokinetics, and immunogenicity of single intravenous (IV) administrations of rHlgM22 in patients with MS.

PI: Alexandra Goodyear, MD
(NCT01803867)

Pilot Study of alpha1-antitrypsin to Treat Neuromyelitis Optica Relapses (A1AT for NMO)

PI: Alexandra Goodyear, MD
(NCT02087813)

Understanding Participation of Racial and Ethnic Groups in Multiple Sclerosis Clinical Trials

PI: Jeffrey Dunn, MD

Antihypertensive Treatment of Acute Cerebral Hemorrhage (ATACh-II)

To 1) determine the therapeutic benefit of intensive treatment compared to standard treatment in patients with death and disability (mRS 4-6) at 3 months among subjects with ICH who are treated within 4.5 hours of symptom onset; 2) compare quality of life at 3 months; 3) compare hematoma expansion; and 4) compare treatment-related serious adverse events within 72hrs.

PI: Chitra Venkatasubramanian, MBBS, MD
(NCT01176565)

Development of Multimodal Imaging Biomarkers for Cognitive Dysfunction in Parkinson's Disease

To develop multimodal imaging biomarkers to characterize the etiology of Parkinson's disease associated cognitive impairment and dementia.
PI: Kathleen Poston, MD, MS

Early Differential Diagnosis of Parkinsonism with Metabolic Imaging and Pattern Analysis

PI: Kathleen Poston, MD, MS

A Phase II, Randomized, Double-blind, Placebo-Controlled Study to Evaluate the Efficacy and Safety of AMG 334 in Chronic Migraine Prevention

To evaluate the effect of AMG 334 compared to placebo on the change from baseline in monthly migraine days, in subjects with chronic migraine.
PI: Sheena K. Aurora, MD
(NCT02066415)

Non-Invasive Neurostimulation of the Vagus Nerve with the Gammacore Device for the Treatment of Cluster Headache

To collect clinical data related to the safety and effectiveness of non-invasive vagus nerve stimulation with the GammaCore® device for the acute treatment of cluster headache.
PI: Sheena K. Aurora, MD
(NCT01792817)

Assessment of LBR-101 in Chronic Migraine

To evaluate the efficacy of two distinct doses of subcutaneous LBR-101 in the preventive treatment of chronic migraine, measured by mean change from baseline in number of monthly cumulative headache hours of any severity on headache days, captured from the daily headache diary, relative to the 28-day post treatment period ending with week 12.
PI: Sheena K. Aurora, MD
(NCT02021773)

A Multicenter Assessment of LBR-101 in High Frequency Episodic Migraine (HFEM)

To evaluate the efficacy of two distinct doses of subcutaneous LBR-101 in the preventive treatment of HFEM, measured by mean change from baseline in the monthly migraine days during the 28-day post treatment period ending with week 12.
PI: Sheena K. Aurora, MD
(NCT02025556)

Migraine Prophylaxis with BOTOX in Adults

To study the long-term efficacy, safety and tolerability of BOTOX (onabotulinumtoxinA) for the prophylaxis of headaches in adult patients with chronic migraine.
PI: Meredith Barad, MD

Screening Tool Validation for Chronic Migraine

PI: Nada Hindiye, MD

Population-based Studies of the Prevalence and Predisposing Factors of Peripheral Neuropathy

In collaboration with epidemiologists at UC Berkeley, the study investigates the potential environmental or occupational risk factors for peripheral neuropathy.
PI: Yuen So, MD, PhD

HDE Post-Approval Study (PAS) of NeuRx DPS™ for ALS

Further investigation on the benefits and risks of diaphragmatic pacing to preserve respiratory function in patients with amyotrophic lateral sclerosis (ALS).
PI: Yuen So, MD, PhD
(NCT01605006)

A Phase IV Study to Evaluate the Efficacy and Safety of Alglucosidase Alfa Produced at the 4000 L Scale for Pompe Disease

PI: John Day, MD, PhD
(NCT01526785)

Brain Networks in Neurodegenerative Diseases

To prospectively evaluate the application of FDG PET to aid in the diagnosis of Parkinson's disease and other atypical Parkinsonian syndromes.
PI: Kathleen Poston, MD, MS

Transient Ischemic Attack (TIA) Triage and Evaluation of Stroke Risk

PI: Gregory Albers, MD
(NCT01423201)

An Exploratory Study to Assess Two Doses of GSK2402968 in the Treatment of Ambulant Boys with Duchenne Muscular Dystrophy

PI: Yuen So, MD, PhD
(NCT01462292)

Efficacy and Safety Trial of MK-8931 in Participants with Prodromal Alzheimer's Disease

A Phase III, Randomized, Placebo-Controlled, Parallel-Group, Double-Blind Clinical Trial to Study the Efficacy and Safety of MK-8931 in Subjects with Amnesic Mild Cognitive Impairment Due to Alzheimer's Disease.
PI: Geoffrey Kerchner, MD, PhD
(NCT01953601)

Analysis of 18F-AV-1451 PET Imaging in Cognitively Healthy, MCI and AD Subjects

An open label, multicenter study evaluating the safety and imaging characteristics of 18F-AV-1451 in cognitively healthy volunteers, subjects with Mild Cognitive Impairment, and subjects with Alzheimer's disease.
PI: Geoffrey Kerchner, MD, PhD
(NCT02016560)

The Aging Brain: Risk for Dementia

This study will enroll older individuals with or without cognitive problems with the goal of determining which factors are most predictive developing dementia.
PI: Geoffrey Kerchner, MD, PhD

Microstructural Brain Imaging Using Ultra-High Field 7-Tesla MRI

To find the earliest structural changes corresponding to Alzheimer's disease and other neurodegenerative conditions and to correlate these changes with memory and other behavioral measures.
PI: Geoffrey Kerchner, MD, PhD

Resting-State Functional MRI for Diagnosing Alzheimer's Disease

To develop a resting-state functional connectivity biomarker able to detect signal in MCI and to distinguish AD from non-AD dementia at the single-patient level.
PI: Michael Greicius, MD, MPH

Prognosis of Critically Ill Neurological Patients

To determine how well health care providers can predict future neurological outcomes, if they differ in the prediction of outcome, and to assess outcomes of this patient population.
PI: Anna Finley-Caulfield, MD

Tissue Banking of Blood, Spinal Fluid or Skin Biopsy for the Research of Neurological Diseases

PI: Yuen So, MD, PhD

Glyburide Advantage in Malignant Edema and Stroke

A randomized, multi-center, prospective, double blind, two-stage, adaptive Phase II trial of RP-1127 (Glyburide for Injection) in patients with a severe anterior circulation ischemic stroke who are likely to develop malignant edema.
PI: Gregory Albers, MD
(NCT01794182)

Platelet-Oriented Inhibition in New TIA and Minor Ischemic Stroke (POINT) Trial

A phase III study to determine if aspirin and clopidogrel together reduces the risk of stroke, heart attacks and other complications compared to aspirin alone.
PI: Gregory Albers, MD, James Quinn, MD
(NCT00991029)

Stroke Hyperglycemia Insulin Network Effort (SHINE) Trial

To determine safety and therapeutic benefit of treating hyperglycemic acute ischemic stroke patients with targeted glucose concentration (80mg/dL - 130 mg/dL).
PIs: Karen Hirsch, MD, James Quinn, MD
(NCT01369069)

Clot Lysis: Evaluating Accelerated Resolution of Intraventricular Hemorrhage Phase III (CLEAR III)

To determine if EVD placement with low-dose rt-PA improves modified Rankin Scale scores at 6 months compared to subjects treated with EVD placement with placebo.

PI: Chitra Venkatasubramanian, MBBS, MD
(NCT00784134)

Safety and Efficacy Evaluation of Threshold Sound Conditioning by Conditioning-enhanced Hearing Aid

PI: Jaime Lopez, MD

CRISP : A Multi-Center Cohort Study of Acute Stroke Patients who are Treated with Endovascular Therapy

The study is designed to determine optimal CT perfusion criteria to select patients for endovascular stroke treatment.

PI: Maarten Lansberg, MD, PhD
(NCT01622517)

A Phase III, Randomized, Open-Label, 500-Subject Clinical Trial of Minimally Invasive Surgery Plus rt-PA in the Treatment of Intracerebral Hemorrhage (MISTIE III)

PI: Chitra Venkatasubramanian, MBBS, MD
(NCT01827046)

Clinical and Genetic Characterization of Myotonic Dystrophy

PI: John Day, MD, PhD

Subject Database and Specimen Repository for Neuromuscular and Neurodegenerative Disorders

PI: John W. Day, MD, PhD

Inherited Neuropathies Consortium

PI: John W. Day, MD, PhD

Development and Validation of a Disability Severity Index for Charcot-Marie-Tooth Disease

PI: John W. Day, MD, PhD
(NCT01455623)

A Study to Assess the Safety, Tolerability, and Pharmacokinetics of Multiple Doses of ISIS 396443 Delivered Intrathecally to Patients with Infantile-Onset Spinal Muscular Atrophy

PI: John W. Day, MD, PhD
(NCT01839656)

A Phase III Efficacy and Safety Study of Ataluren (PTC124) in Patients with Nonsense Mutation Dystrophinopathy

PI: John W. Day, MD, PhD
(NCT01826487)

Phase I/Ib, Multicenter, Open-label, Dose-Escalation and Expansion Study to Evaluate the Safety and Antitumor Activity of MEDI3617, a Human Monoclonal Antibody Directed Against ANG2, as a Single-Agent or in Combination Therapy in Adult Subjects with Advanced Solid Tumors.

PIs: Seema Nagpal, MD and Lawrence Recht, MD
(NCT01248949)

**RADIOLOGY/NEURORADIOLOGY
Quantifying Collateral Perfusion in Cerebrovascular Disease**

This study utilizes MRI to improve the detection and assessment of collateral blood vessels in patients with diseases of the brain, such as Moyamoya disease and stroke.

PI: Greg Zaharchuk, MD, PhD
(NCT01419275)

ExAblate Transcranial MR Guided Focused Ultrasound for the Treatment of Essential Tremors

A prospective, randomized, double-blind crossover, multi-site, two-arm study will test the efficacy of treatment using the ExAblate Transcranial System and demonstrate safety in medication-refractory tremor in subjects with essential tremor.

PI: Pejman Ghanouni, MD, PhD
(NCT01827904)

A Feasibility Study to Evaluate the Safety and Initial Effectiveness of MR Guided High Intensity Focused Ultrasound (MRgHIFU) in the Treatment of Facetogenic Lumbar Back Pain

To evaluate the safety and initial effectiveness of using MR guided focused ultrasound technology to treat low back pain caused by facet joint arthritis.

PI: Pejman Ghanouni, MD, PhD

Advanced MR and CT Imaging for Understanding Acute Stroke Evolution and Predicting Response to Recanalization Therapy

To evaluate the diagnostic ability of MRI and CT to reliably identify irreversibly damaged tissue, at-risk tissue and tissue that is most likely to transform into hemorrhage in acute stroke patients.

PIs: Roland Bammer, PhD and Greg Albers, MD

Microvascular Measures of Perfusion in Stroke Recanalization

This study will lead to better understanding of mapping flow and microvascular status in patients with severe cerebrovascular disease and greatly enhance the already significant diagnostic power of MRI in acute ischemic stroke by better mapping metabolic perfusion mismatches after reperfusion.

PIs: Michael Moseley, PhD and Greg Albers, MD

Imaging Collaterals in Acute Stroke (iCAS)

The goal of this multi-center NIH study is to develop new magnetic resonance imaging methods to assess brain collaterals and to evaluate whether this information can help us better identify acute stroke patients who would benefit from endovascular therapy.

PI: Greg Zaharchuk, MD, PhD

INTERVENTIONAL NEURORADIOLOGY

A Randomized, Concurrent Controlled Trial to Assess the Safety and Effectiveness of the Separator 3D as a Component of the Penumbra System in the Revascularization of Large Vessel Occlusion in Acute Ischemic Stroke

Patients with acute ischemic stroke and evidence of a large vessel (> 3mm in diameter) occlusion in the cerebral circulation will, if within 8 hours of symptom onset, be assigned to the Penumbra System with or without the Separator 3D and followed for 3 months.

PI: Huy M. Do, MD
(NCT01584609)

PEDIATRIC NEUROLOGY

Migraine Prophylaxis with BOTOX in Children

To study the long-term efficacy, safety and tolerability of BOTOX (onabotulinumtoxinA) for the prophylaxis of headaches in adolescents patients (children 12 to < 18 years of age) with chronic migraine.

PI: Meredith Barad, MD

CHAMP: The Childhood and Adolescent Migraine Prevention Study

To evaluate if amitriptyline (AMI) and topiramate (TPM) are superior to placebo in reducing migraine frequency in children and adolescents, ages 8 to 17 years old, inclusive, and to conduct a comparative effectiveness study of the two therapies.

PI: Sheena K. Aurora, MD
(NCT01581281)

Phase III Study Evaluating Limited Target Volume Boost Irradiation and Reduced Dose Craniospinal Radiotherapy 18.00 Gy and Chemotherapy in Children with Newly Diagnosed Standard Risk Medulloblastoma

PI: Paul Fisher, MD
(NCT00085735)

A Randomized Phase II/III Study of Vorinostat and Local Irradiation OR Temozolomide and Local Irradiation OR Bevacizumab and Local Irradiation Followed by Maintenance Bevacizumab and Temozolomide in Newly Diagnosed High Grade Glioma

PI: Paul Fisher, MD
(NCT01236560)

Efficacy of Carboplatin Administered Concomitantly with Radiation and Isotretinoin as a Pro-Apoptotic Agent in Other than Average Risk Medulloblastoma/PNET Patients

PI: Paul Fisher, MD
(NCT00392327)

Phase II Screening Trial of Temozolomide with Irinotecan versus Temozolomide, Irinotecan plus for Recurrent/Refractory Medulloblastoma/CNS PNET of Childhood

PI: Paul Fisher, MD
(NCT01217437)

Phase III Randomized Trial of Post-Radiation Chemotherapy in Patients with Newly Diagnosed Ependymoma Ages 1-21 years

PI: Paul Fisher, MD
(NCT01096368)

A Phase II Study of Sunitinib in Recurrent, Refractory or Progressive High Grade Glioma and Ependymoma Brain Tumors in Pediatric and Young Adult Patients

PI: Paul Fisher, MD
(NCT01462695)

A Phase II Randomized Trial of Lenalidomide in Pediatric Patients with Recurrent, Refractory or Progressive Juvenile Pilocytic Astrocytoma and Optic Pathway Gliomas

PI: Paul Fisher, MD
(NCT01553149)

Phase II Trial of Response-Based Radiation Therapy for Patients with Localized Central Nervous System Germ Cell Tumors

PI: Paul Fisher, MD
(NCT01602666)

Phase I and Pharmacokinetic Study of AZD6244 for Recurrent or Refractory Pediatric Low Grade Glioma

PI: Paul Fisher, MD
(NCT01089101)

Risk-Adapted Therapy for Young Children with Embryonal Brain Tumors, High-Grade Glioma, Choroid Plexus Carcinoma Or Ependymoma (SJYC07)

PI: Paul Fisher, MD
(NCT00602667)

Phase II Clinical Trial Evaluating the Efficacy and Safety of GDC-0449 in Children with Recurrent or Refractory Medulloblastoma

PI: Paul Fisher, MD
(NCT01239316)

Comprehensive Molecular Analysis of Tumor Samples Derived From Patients with Diffuse Brainstem Glioma—A Pilot Study

PI: Paul Fisher, MD
(NCT00899834)

A Phase II Placebo-Controlled Trial of Modafinil to Improve Neurocognitive Deficits in Children Treated for a Primary Brain Tumor

PI: Paul Fisher, MD
(NCT01381718)

A Molecular Biology and Phase II Study of Imetelstat (GRN163L) in Children with Recurrent High-Grade Glioma, Ependymoma, Medulloblastoma/Primitive Neuroectodermal Tumor (PNET) and Diffuse Intrinsic Pontine Glioma (DIPG)

PI: Paul Fisher, MD
(NCT01836549)

Quality of Life continued ►

in how data is collected gives patients a direct role in improving both their short- and long-term care, this robust and expanding database will also positively impact the care of all future spine patients at Stanford and beyond.

For example, outcome data for specific cohorts of patients, such as those with diabetes, can be easily generated and analyzed. These data will help determine which treatments are the most successful at minimizing pain and returning this particular subset of patients to work. Moreover, the success of any measurable post-surgical intervention used to improve recovery, such as physical therapy or epidurals, can be analyzed to determine what is and what is not working. “Our ability to integrate quality of life metrics at multiple time points with routine patient care is paramount to our mission to meticulously choose treatments geared toward the highest potential long-term benefit of every patient,” says Dr. Ratliff. “This approach will contribute to development of patient registries and maintains focus on achieving the best possible outcomes. We are very excited about this integrated data base’s potential.” ■



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