Synapse
a clinical resource
SUMMER 2014, VOL. 5, ISSUE 2

Cortical Stimulator for Language Mapping

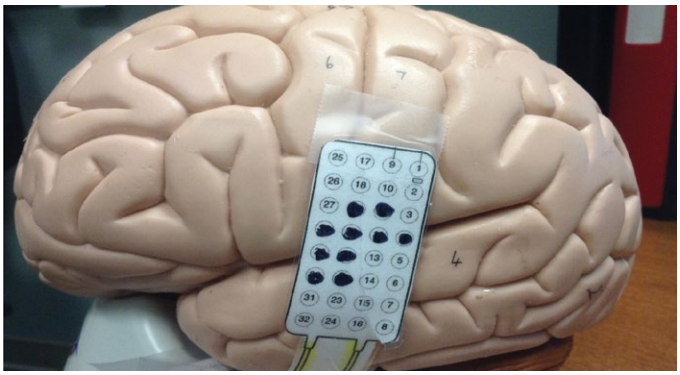
Edwin Cruz, MD

A Nihon Kohden cortical stimulator, purchased through a generous grant from Mercy Foundation, was recently used for the first time at Mercy General Hospital to perform a left temporal lobectomy on a 39-year-old man with intractable epilepsy. The cortical stimulator is a device that allows the neurologist to map out vital cortical function areas during brain surgery, helping the surgeon to remove enough brain tissue to render a patient seizure free, but at the same time spare vital areas for speech, memory or language.

The surgery, performed by neurosurgeon Cully Cobb, MD, was the culmination of a careful evaluation conducted over a year in collaboration with Marysville neurologist Wenchiang Han, MD to establish that the patient was an appropriate candidate.

Phase 1 of the 2012 evaluation documented that the seizures lateralized to the left hemisphere, but left unclear whether they localized to the frontal or temporal lobes. Other parts of the comprehensive epilepsy surgery evaluation included detailed neuropsychological testing, a Wada test to localize the patient's memory and language function and 3T MRI and PET scanning. Finally, to further localize the patient's seizure focus, Phase 2 VEEG monitoring was performed by Dr. Cobb on January 28, 2014. A total of 102 intracranial contact points were surgically implanted over the left temporal, parietal and frontal lobes.

The new Cortical Stimulator provided a very crucial piece of information. Because the patient was left hemisphere dominant for speech, language and verbal memory, surgery to the area could potentially damage those functions. During over three hours of testing, selected electrodes on the EEG intracranial electrode grid were individually activated with the patient awake so speech, language and memory functions could be evaluated. In the end, it was proven that speech and language areas were outside the planned surgical resection margin.



Functional cortical mapping-black dots indicate areas with language deficits when stimulated.

On February 3, 2014 the patient underwent a left temporal lobectomy. The procedure was well tolerated, and thanks to the preoperative functional exploration with the cortical stimulator, there were no postoperative deficits. The probability of the patient becoming seizure free is about 70%, which is a dramatic improvement from his three to four seizures a month for the past 20 years, despite multiple anti-seizure medications. The patient and his family have expressed appreciation for the excellent care they experienced through the Dignity Health Neurological Institute. The patient's discharge to his home seizure free and without any neurologic deficits would not have been possible without the team effort of the neurology nurses, EEG techs, neuropsychologist and physicians of the Mercy Epilepsy Center.

For references, comments or questions please email Dr. Cruz at DignityHealthNeuro@DignityHealth.org. ■

Edwin Cruz, MD

Dignity Health™
Neurological Institute
of Northern California

To view **Synapse** electronically, visit DignityHealth.org/Synapse.

For your convenience in neurological referrals, call the Dignity Health Doctor Direct referral line at 855.685.5050.

Dignity Health Neurological Institute Provides Comprehensive Neurocritical Care

Alex Nee, MD

Acute neurological injury requires rapid assessment, resuscitation and stabilization to prevent secondary injury and adverse outcome. After initial stroke assessment, for example, 25 percent of patients experience deterioration in the form of stroke progression, brain edema, hemorrhage or recurrent ischemia. This threat highlights the need for close observation and assessment, which is best provided in dedicated neurointensive care units.

One of the newest and fastest-growing subspecialties in medicine today, neurocritical care (also referred to as neurointensive care) is unique in its concern with comprehensive multisystem treatment and the interface between the brain and other organ systems in the setting of critical illness. Neurointensivists manage critically ill patients with stroke, neuromuscular disease, traumatic injury, increased intracranial pressure and other neurological disorders, as well as the associated complications that may follow, especially those of the heart, lung and kidneys.

Given the complexity of severe stroke and potential complications, a neurointensivist works closely with multidisciplinary teams composed of neurosurgeons, neuroradiologists, neurologists, emergency medicine and other medical and surgical specialists, as well as pharmacists, critical care nurses, respiratory therapists, rehabilitation therapists and social workers. Neurointensivists may have training in many fields including neurology, anesthesiology, emergency medicine or neurosurgery.

Today, therapeutic advances are being put into practice and improving neurocritical care at Dignity Health Neurological Institute. Our board certified neurointensivists, with their comprehensive team, provide 24/7 support in our dedicated neurological ICUs. To help identify critical problems before permanent neurologic injury occurs, neurological intensive care requires proficiency with not only standard forms of ICU monitoring (such as cardiovascular hemodynamic monitoring and mechanical ventilation) but also specialized forms of neurological monitoring (such as intracranial pressure and continuous EEG monitoring) and interventions (such as hyperdynamic therapy and therapeutic hypothermia).

The effectiveness of such comprehensive care in lessening the rates of mortality and morbidity after stroke is demonstrated in numerous studies, and the positive effects and impact of improved outcomes are well supported by evidence. The benefits from treatment in a stroke unit are well described and evidence based, and this has led to new levels of achievement for highly evolved and advanced stroke programs. Standardized stroke orders or integrated stroke pathways improve adherence to best practices for treatment of patients with stroke. The American Heart and Stroke Associations' Get With The Guidelines® Stroke program has produced improved care processes and sustained increased adherence to stroke performance measures.

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Alex Nee, MD

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Dignity Health Neurological Institute Provides Comprehensive Neurocritical Care—continued from page 2

In September 2012, to recognize the significant investment in infrastructure, staff and training needed for truly state-of-the-art complex stroke care, The Joint Commission and the American Heart Association/American Stroke Association launched a new level of advanced certification: the Comprehensive Stroke Center (or CSC). To attain CSC certification, organizations must not only meet all of the general eligibility requirements for Disease-Specific Care and Primary Stroke Center certification, but also:

- Have dedicated neurointensive care unit beds for complex stroke patients that provide neurocritical care 24 hours a day, seven days a week
- Use advanced imaging capabilities
- Coordinate post-hospital care for patients
- Participate in stroke research
- Use a peer review process to evaluate and monitor the care provided to ischemic stroke and subarachnoid hemorrhage patients

Dignity Health Neurological Institute has planned and developed a program to achieve this level of excellence and standard. Dedicated neurological intensive care units, run by a multidisciplinary team of neurologists, neurosurgeons and neuroscience nurses, are led by neurointensivists with fellowship training from UCLA and Stanford—world leaders in neurological critical care and comprehensive stroke care services. Neurological ICUs feature advanced technology for multimodality neuromonitoring, cooling and interventions. The physicians are assisted by neuroscience intensive care nurses specially trained to monitor and treat patients with neurocritical illness while maintaining optimal vital functions. All are guided by evidence-based practices and established "best of the best" models of care. These are all key elements of the neurovascular services program and are required for Comprehensive Stroke Certification.

For references, comments or questions please email Dr. Nee at DignityHealthNeuro@DignityHealth.org. ■

Management of Unruptured Intracranial Aneurysms

Lucian Maidan, MD

Intracranial aneurysms are abnormal outpouchings of a blood vessel wall, usually arterial. They have a relatively low prevalence in the general population, up to six to nine percent in several postmortem studies and one to two percent in angiographic studies of patients undergoing cerebral angiography for indications other than subarachnoid hemorrhage. The most common aneurysms are the saccular aneurysms, also called "true aneurysms," because they have some of the layers of a normal blood vessel, including adventitia and intima, but they are missing the muscularis and internal elastic lamina, which terminate at the neck of the aneurysm.

Due to the fact that 10 to 30 percent of patients will have multiple aneurysms, the multiplicity of aneurysms is up to five times more common in women than in men.

The majority of all saccular intracranial aneurysms are located in the anterior circulation, especially the anterior and posterior communicating arteries and the middle cerebral artery bifurcation. Only 10 percent arise in the posterior circulation, and most of those are from the basilar artery.

While the most common presentation for intracranial aneurysms is subarachnoid hemorrhage, aneurysms can also cause symptoms by exerting mass effect on surrounding structures. An acute onset of a third cranial nerve palsy (ptosis, limited eye adduction, midriasis) can be caused by enlargement of an aneurysm of the posterior communicating artery. Visual loss can be caused by an ophthalmic artery aneurysm that compresses the optic nerve. Large or partially thrombosed aneurysms can cause seizures, headaches, transient ischemic attacks or cerebral infarction secondary to distal emboli. Unruptured aneurysms presenting with these syndromes have a six percent annual rupture rate, which is much higher than that of incidentally discovered aneurysms. Cigarette smoking, uncontrolled hypertension, excess alcohol consumption and drug use have been shown to correlate with aneurysm growth and rupture.

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Lucian Maidan, MD

Management of Unruptured Intracranial Aneurysms—continued from page 3

Although 50 to 80 percent of all unruptured aneurysms do not rupture during the course of a person's lifetime, those which do rupture are responsible for 80 to 90 percent of non-traumatic subarachnoid hemorrhages, which has 45 percent mortality at 30 days, and leaves 30 percent of survivors with moderate-to-severe disability. Subarachnoid hemorrhages are twice as common in females as males and have a peak incidence in people 55 to 60 years old.

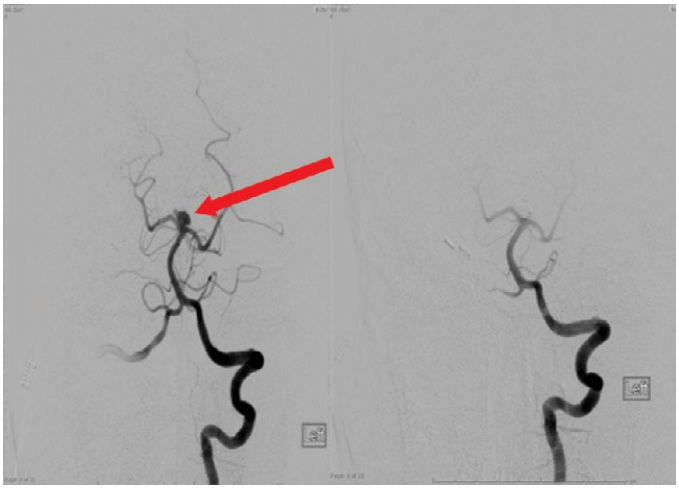
For unruptured aneurysms with no previous history of subarachnoid hemorrhage, less than 5mm, medium 5 to 10mm, larger than 10mm, and giant above 25mm, the annual rupture rates are of 0.8%, 1.2%, 7.1% and 43.1%, respectively.

Defining the location, the size and the morphology of the aneurysm can be done by CT angiography (CTA), magnetic resonance angiography (MRA) or by catheter angiography. Although neurological complications can occur in 0.5 to 1.0 percent of cases, the benchmark for identifying and evaluating the morphological characteristics of an aneurysm is still catheter angiography.

Although familial cerebral aneurysms have been described, most aneurysms are considered to be sporadically acquired. Nevertheless screening with magnetic resonance angiography is recommended for people who have two or more first degree relatives with intracranial aneurysms.

Other conditions associated with cerebral aneurysms include autosomal dominant polycystic kidney disease, fibromuscular dysplasia, Marfan's syndrome, Ehlers–Danlos syndrome type IV, neurofibromatosis type I, moya-moya disease and arteriovenous malformations of the brain. Uncommon causes of saccular aneurysms include infection, trauma, tumor, cocaine use and other cerebral vascular malformations such as high-flow AVMs. Screening is also recommended for all patients with autosomal dominant polycystic kidney disease.

Treatment of the unruptured cerebral aneurysms has to be individualized, taking into account location (posterior circulation more prone to rupture), morphology (presence of daughter sacs), and size of the aneurysm—in addition to the patient's inherent risk factors, including age and sex. In general, treatment should be offered to all patients with symptomatic



Cerebral angiogram of the left vertebral artery injection of a basilar artery aneurysm (arrow) before and after endovascular coil embolization.

aneurysms and to all with a history of prior subarachnoid hemorrhage, less than 45 years of age, aneurysms larger than 5mm in patients younger than 65 years of age or more than 10mm in younger than 70 years of age. Conservative treatment should be considered for aneurysms less than 5mm. Treatment for hypertension and smoking cessation is recommended for all patients with unruptured intracranial aneurysms. Because, overall, more than six percent of aneurysms grow over time (the larger the aneurysm the larger the chance of enlargement), follow-up with noninvasive CTA or MRA should be done at six and 12 months from initial diagnosis, then yearly for a minimum of three years.

We need to counsel each patient with unruptured intracranial aneurysm in the framework of a multidisciplinary team which includes a neurosurgeon and an interventional endovascular neuroradiologist.

For references, comments or questions please email Dr. Maidan at DignityHealthNeuro@DignityHealth.org. ■

Autonomic Dysreflexia: An Often Unrecognized Issue in Patients with Spinal Cord Injury

Jeremy Wren, DO

Spinal cord injury is a relatively common phenomenon with approximately 12,000 new injuries yearly and 300,000 people living with spinal cord injury in the United States. The majority of these injuries are a result of motor vehicle accidents, while falls and gunshot wounds are the two other most common etiologies. Nearly half of these injuries occur somewhere in the level of the cervical spine resulting in tetraplegia.

An under-recognized problem in patients with spinal cord injuries is autonomic dysreflexia. This phenomenon is the result of a normal response of the autonomic nervous system to a noxious stimulus which is interrupted as a result of the spinal cord injury. It typically occurs in patients who have sustained an injury at or above the T6 level and is more common in complete spinal cord injury.

"An under-recognized problem in patients with spinal cord injuries is autonomic dysreflexia. This phenomenon is the result of a normal response of the autonomic nervous system to a noxious stimulus which is interrupted as a result of the spinal cord injury."

When the body is subjected to a noxious stimulus, there is a sympathetic response that is mediated at the level of the spinal cord with subsequent vasoconstriction and elevation in blood pressure. In normal physiology, this elevation in blood pressure is mitigated by descending inhibition of sympathetic tone as well as an increase in parasympathetic tone. These inhibitory responses can be impaired or completely interrupted in patients with spinal cord injury. The result of this is a presentation where patients will demonstrate dramatic sympathetic tone below the level of their spinal cord injury (vasoconstriction and cool, clammy skin) while demonstrating a marked parasympathetic response above the level of the spinal cord injury (flushing, sweating, a stuffy nose, and vasocongestion).

Severe pounding headaches are a common complaint, and patients often report blurred vision, chest pressure or a sense of anxiety. There is dramatic rise in blood pressure during episodes of autonomic dysreflexia which can result in life threatening sequela such as intracerebral hemorrhage. One reason these symptoms are often misconstrued as other diagnoses is that patients with tetraplegic spinal cord injuries often have much lower resting systolic blood pressures (e.g. 70-100mmHg). It is easy to see in a situation such as this how a patient that presents with headaches and a systolic blood pressure of 150mmHg may be misdiagnosed as having a migraine, for example, when in actuality their systolic blood pressure is elevated by 50-80mmHg from their resting blood pressure, and they are demonstrating typical features of autonomic dysreflexia.

Anything that would typically be perceived as painful in a neurologically intact individual can precipitate autonomic dysreflexia if it occurs below the level of cord injury. A typical cause is a distended bladder due to the need for intermittent catheterization or a Foley catheter which has become kinked or blocked. Bowel issues such as fecal impaction, hemorrhoids or anal fissures are other potential etiologies, as are tight fitting clothing or shoes. Pressure ulcers, ingrown toenails, burns, vertebral compression fractures and many other causes have also been reported.

Treatment of autonomic dysreflexia should be focused on identifying and alleviating the underlying, noxious stimulus. Patients should be sat upright, and any restrictive clothing should be loosened with a subsequent search for the root cause of the symptoms. If this is not immediately identified, blood pressure can be temporarily controlled with a variety of agents, although Nitropaste is often utilized as it is easily removed once the offending stimulus is addressed and the symptoms abate.

Given the relative infrequency of this presentation in daily clinical practice, it is paramount that patients receive education regarding autonomic dysreflexia and its management. There are electronic copies of printable information cards available through resources such as the National Spinal Cord Injury Association. These cards can be carried by the patient and presented to health care providers who may be unfamiliar with these symptoms. With greater awareness among patients and health care providers, we can ensure that this unusual condition, which is common amongst people with spinal cord injuries, is identified and treated appropriately.

For references, comments or questions please email Dr. Wren at DignityHealthNeuro@DignityHealth.org. ■

Jeremy Wren, DO

Syncope

Peter Skaff, MD

Syncope is defined as a transient lapse of consciousness that is accompanied by a loss of postural tone from which the recovery is spontaneous and complete. The presentation is typically sudden and dramatic, and though the causes are protean, a systematic approach to evaluation of syncope can effectively narrow the differential diagnosis. This process is essential to risk stratify patients for whom the syncopal episode may be a harbinger of a serious medical problem or even sudden cardiac death. Even benign forms of syncope can result in secondary injury due to a fall resulting from the loss of consciousness. In the process of identifying the cause of syncope, it is also important to differentiate syncope from non-syncopal causes of lapse of consciousness. In all cases, identification of the underlying cause is the key to treatment and prevention of subsequent episodes.

Vasovagal syncope (aka neurocardiogenic or vasodepressor syncope) is the most common cause of syncope in young to middle-aged adults, though arrhythmias due to Wolff-Parkinson-White or Long QT Syndrome should be considered. In middle-age and older individuals, tussive, micturition, defecation, and orthostatic forms of syncope become more common. In older individuals, carotid sinus hypersensitivity and cardiogenic syncope due to aortic stenosis, cardiomyopathy, heart failure, and arrhythmias become more likely. Numerous medications may predispose to syncope and should be reviewed carefully. Anti-hypertensive agents, narcotics, dopaminergic agents, and medications with anti-cholinergic properties increase risk of syncope, particularly in the elderly.

The initial evaluation of any lapse of consciousness begins with a careful and detailed history of the event. If there is a bystander who witnessed the episode, it is often helpful to obtain a description of the event. Careful attention should be paid to premonitory symptoms. Faintness, dizziness or light-headedness is common in vasovagal and orthostatic syncope. Palpitations, chest pain or shortness of breath may or may not precede syncope due to arrhythmia, which is often sudden and without premonitory symptoms.

Seizures resulting in loss of consciousness are typically associated with increased limb tone either with or without clonic activity. While syncope most typically results in loss of tone, carpal/pedal spasms are fairly common, and brief convulsions may occur. In true seizures, post-ictal confusion and/or the presence of focal neurological signs suggest a seizure rather than syncope. Cerebrovascular causes of syncope are rare. However, vertebrobasilar insufficiency may result in sudden drop attacks or lapses of consciousness, and is typically accompanied by focal neurological symptoms and signs.

The physical examination of the syncopal patient should focus on identification of orthostatic blood pressure changes, signs of autonomic dysfunction, and signs of cardiopulmonary disease. The presence of focal neurological signs should also be sought. An electrocardiogram (EKG) to assess for rhythm and conduction abnormalities rounds out the initial evaluation of syncope. In most cases, the history, physical examination, and EKG are all that are needed to arrive at a diagnosis.

"Cerebral imaging with CT or MRI, carotid Doppler ultrasonography, and Electroencephalography (EEG) are not indicated in the evaluation of syncope, unless specific, neurological signs and symptoms are present."

For patients in whom a specific diagnosis cannot be made after H&P and EKG, additional laboratory studies may be helpful in a minority of cases. These include echocardiography, exercise stress test, and continuous EKG monitoring (e.g., Holter Monitor for frequent events, implantable loop recorder for infrequent events). Tilt-table testing is sometimes helpful in establishing a diagnosis of neurocardiogenic syncope when the history is suggestive, but inconclusive. Cerebral imaging with CT or MRI, carotid Doppler ultrasonography, and Electroencephalography (EEG) are not indicated in the evaluation of syncope, unless specific, neurological signs and symptoms are present.

For references, comments or questions please email Dr. Skaff at DignityHealthNeuro@DignityHealth.org. ■

Peter Skaff, MD

Brainwaves: Updates from Dignity Health Neurological Institute

Mercy MS Achievement Center Expands its Service

The Mercy MS Achievement Center, part of the Dignity Health Neurological Institute of Northern California, is expanding its program to a second day after the once-a-week center quickly reached capacity after opening in February 2014. The Achievement Center offers day wellness services for people and their families facing the challenges of multiple sclerosis.

The Mercy MS Achievement Center, located at 7777 Greenback Lane, Suite 108, in Citrus Heights, is the only one of its kind in Northern California, providing wellness programming to address the physical, mental, cognitive, recreation and information needs of people with MS. Programs include group physical activities, cognitive stimulation, individualized fitness programs, education classes and recreational activities.

A generous grant to Mercy Foundation from the Conrad N. Hilton Foundation provided the necessary startup capital and operational expenses for the Mercy MS Achievement Center's $1.5 million budget. The center opened in February, offering the wellness program once a week on Thursdays. Now at capacity, the Mercy MS Achievement Center will offer services a second day a week in July.

"We are off to a great start. These services will greatly improve the physical function and quality of life for both MS patients and their families," said Brian Hutchinson, director of the Mercy MS Achievement Center. "The initial success of our program speaks to the great need for the services we are providing in this region."

The Mercy MS Achievement Center builds on the Mercy MS Center's long-standing leadership in the treatment of MS, with a comprehensive team approach and specially trained staff. The Mercy MS Center was established in 2009 by John Schafer, MD, an experienced neurologist who has been treating MS for many years and serves as the center's director. The Mercy MS Center was the first in California to be designated a comprehensive center for MS care by the National Multiple Sclerosis Society. Since 2009, the Mercy MS Center has served nearly 1,000 patients. Dr. Schafer also serves as the medical director of the Mercy MS Achievement Center.

Dignity Health Welcomes Neurology and Sleep Medicine Specialist Robert Dias, MD

Dr. Dias, a graduate of University of Maryland, is board certified in neurology, clinical neurophysiology and sleep medicine. He completed his neurology residency at the UC Davis Medical Center, and completed fellowships in clinical neurophysiology and sleep medicine, also at the UC Davis Medical Center.

Dr. Dias enjoys integrating general neurology with sleep medicine in an effort to comprehensively manage patients and improve their overall quality of life. Prior to his arrival in the Sacramento area, Dr. Dias spent time volunteering in neurology clinics in Spain and providing door-to-door vaccinations in underserved neighborhoods in Santa Ana, CA. Today, he's proud to be serving the Greater Sacramento community as the newest addition to the team of renowned specialists comprising Dignity Health Neurological Institute of Northern California. ■

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CONTINUING MEDICAL EDUCATION 2014

Movement Disorders

An Insights & Innovations Exclusive CME Event

Wednesday, November 5, 2014 at 5:30 p.m.

North Ridge Country Club
7600 Madison Avenue
Fair Oaks, CA 95628

Join Dignity Health Neurological Institute for an evening CME opportunity presenting the latest diagnosis and treatment options for patients affected by movement disorders.

Register online at DignityHealth.org/NeuroCME. The cost is free. Space is limited. Early registration is recommended.

Dignity Health is accredited by the Institute for Medical Quality/California Medical Association (IMQ/CMA) to provide continuing medical education for physicians.

Dignity Health designates this live educational activity for a maximum of *2 AMA PRA Category 1 Credits.*™ Physicians should claim only the credit commensurate with the extent of their participation in the activity.

This credit may also be applied to the CMA Certification in Continuing Medical Education.

Monthly Neuro Grand Rounds

Mercy San Juan Medical Center
Conference Rooms 2, 3 and 4
First Friday of each month
at 12:30 p.m.

Epilepsy Case Conference

Mercy General Hospital
North Auditorium
Fourth Tuesday of each month
at 6 p.m.

tPA and Neurocritical Care Case Conferences

Mercy San Juan Medical Center
Conference Room 2
Second Wednesday of each month,
5 to 7 p.m.

If you have any questions about upcoming opportunities, or would like to coordinate WebEx access, contact DignityHealthNeuro@DignityHealth.org or call 916.962.8751.

Synapse

Reader Survey

Dignity Health Neurological Institute of Northern California is committed to providing the latest innovations and discoveries in the field of neurosciences to our readers. To ensure we're serving your best interests, please fill out the survey on the reverse side.

You can fax your response to 916.864.6482, email a scanned copy to DignityHealthNeuro@DignityHealth.org, or fill out the form online at DignityHealth.org/Synapse.

In advance, thank you.

—John Schafer, Editor-in-Chief, **Synapse**

Synapse

Reader Survey

Name (optional): _____

Title (circle one, optional): MD RN PA NP other

Email address (optional): _____

How would you rate the usefulness of Synapse newsletters to your practice?

☐ Very ☐ Somewhat ☐ Not at all

How relevant are the issues addressed in Synapse to your practice?

☐ Very ☐ Somewhat ☐ Not at all

How readable is Synapse?

☐ Very ☐ Somewhat ☐ Not at all

Do you share Synapse with others?

☐ Yes ☐ No

Do you like the length of Synapse—an 8-page publication?

☐ Too long ☐ Too short ☐ Just right

Do you like the frequency of Synapse (mailed once every four months)?

☐ Too frequent ☐ Not frequent enough ☐ Just right

Would you like to receive Synapse electronically?

☐ Yes ☐ No

Do you have suggestions for neurological topics for future issues?

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Would you be interested in submitting articles, including case studies?

☐ Yes ☐ No

If yes, please email DignityHealthNeuro@DignityHealth.org.

Do you have suggestions that would improve Synapse?

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How would you rate the newsletter overall?

☐ Excellent ☐ Very good ☐ Good

☐ Satisfactory ☐ Poor

How would you rate the appearance/look of the newsletter?

☐ Excellent ☐ Very good ☐ Good

☐ Satisfactory ☐ Poor

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