

# Synapse

a clinical resource

FALL 2015, VOL. 6, ISSUE 3

## The War on Stroke: An Update from the Field

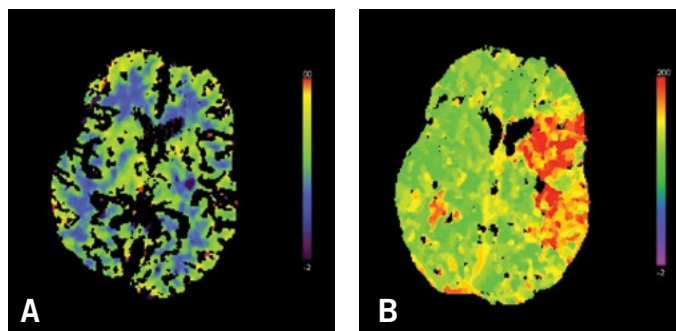
George Luh, MD

The war on stroke has been waged for over 20 years. In 1995 the NINDS study showed patients treated with IV t-PA were at least 30 percent more likely to have minimal or no disability at three months compared with patients given placebo. In 1999 the PROACT II study demonstrated a 15% absolute difference in outcomes in favor of patients treated with intra-arterial pro-urokinase compared to medical therapy. Prior to 2010, stroke was the third leading cause of death and currently it has dropped to fifth place.

Only two years ago the Interventional Management of Stroke (IMS III) trial, Mechanical Retrieval and Recanalization of Stroke Clots Using Embolectomy (MR RESCUE), and SYNTHESIS-Expansion trials failed to demonstrate significant benefit of mechanical thrombectomy in treating acute ischemic stroke secondary to emergent large vessel occlusion (ELVO). Unfortunately, these three trials suffered from poor patient selection due to lack of modern imaging techniques, long treatment delays, poor revascularization rates, and the use of antiquated mechanical thrombectomy devices.

Today with the proper use of imaging to improve patient selection and the use of modern mechanical thrombectomy devices five recent multicenter prospective randomized controlled worldwide trials have provided us with level 1a evidence that mechanical thrombectomy is beneficial in patients with acute ischemic stroke (AIS) secondary to ELVO. (Table 1).

These five trials provide overwhelming evidence that endovascular therapy (ET) is the treatment of choice for

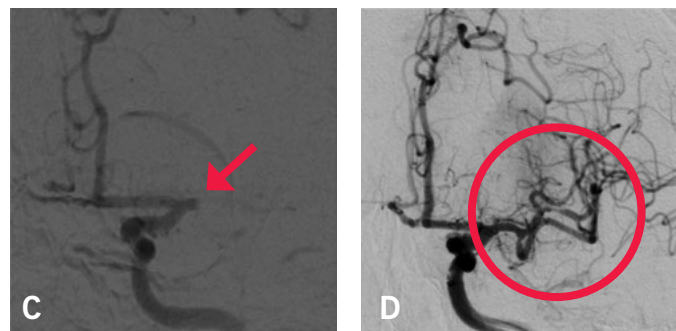


### Advanced Stroke Imaging: CT Perfusion

This is a 71-year-old female, presented with acute onset of right hemiparesis, right facial droop, slurred speech, and gaze deviation consistent with left MCA syndrome.

A. Blood Volume color map shows normal brain i.e. no infarction.

B. Time to Peak color map shows large ischemic penumbra i.e. brain at risk. (orange color)



### Mechanical Thrombectomy (Procedure time: 10 minutes)

C. Left carotid angiogram shows left MCA occlusion (arrow).

D. Left carotid angiogram following successful mechanical thrombectomy shows recanalization of left MCA (circle). The patient had an excellent outcome and was discharged home 3 days later. 60 day mRS: 1.

emergent large vessel occlusions. This makes sense given that half of all acute ischemic strokes are due to a large vessel occlusion and the recanalization rate of IV t-PA alone for clots 8 mm or greater in size is essentially 0%. Prior studies have shown that vessel recanalization strongly correlates with good clinical

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**Table 1**

Study	MR-CLEAN	ESCAPE	EXTEND-IA	REVASCAT	SWIFT PRIME
Date	2010-2014	2013-2014	2012-2014	2012-2014	2012-2015
Enrolled	500	315	70	206	196
Age Limit	No upper limit	No upper limit	No upper limit	85 years old	80 years old
Study Design (ET=Endovascular Therapy)	IV t-PA + ET vs IV t-PA	IV t-PA + ET vs IV t-PA	IV t-PA + ET vs IV t-PA	IV t-PA + ET vs IV t-PA	IV t-PA + ET vs IV t-PA
Recanalization Rate ET vs IV t-PA	58% vs 32%	72% vs 31%	86% vs 37%	66% vs NA	88% vs 40%
Good Outcome at 90 days (mRS ≤2) ET vs IV t-PA	33% vs 19%	53% vs 29%	71% vs 40%	44% vs 28%	60% vs 36%
Time Window for Treatment	6 hrs	12 hrs	4.5 hrs	8 hrs	6 hrs
Death ET vs IV t-PA	19% vs 18%	10% vs 19%	9% vs 20%	18% vs 16%	9% vs 12%
Reference	N Engl J Med 2015; 372:11-20	N Engl J Med 2015; 372:1019-1030	N Engl J Med 2015; 372:1009-1018	N Engl J Med 2015; 372:2296-2306	N Engl J Med 2015; 372:2285-2295

outcome. Current mechanical thrombectomy devices provide a recanalization rate of 70% or greater. By comparison, we have performed 120 mechanical thrombectomies since January 2014 and our own recanalization rate is 94%.

Recanalization is only half the story. One of the major reasons the prior mechanical thrombectomy trials of 2013 failed to show benefit was because of long treatment delays. Getting the patient to the angiography suite requires the concerted effort of EMS and ED personnel. Studies show that only half of AIS patients access the ED through 9-1-1 and EMS. Primary care physicians are key to educating patients in the warning signs of acute stroke and to call 9-1-1 immediately. Time is brain. Every second counts. 1.8 million neurons are lost each minute a large vessel occlusion remains untreated. Even if there is successful recanalization, for every 30 minutes of delay in treatment the chance of a good clinical outcome decreases by 10%. Unfortunately, patients often wait to call for help because

they expect that symptoms will resolve.

The Dignity Health Neurological Institute is involved in further improving outcomes in AIS patients by using advanced neuroimaging to improve patient selection, performing research trials evaluating the next generation of thrombectomy devices, and continuous refinement of the transfer/ED process to minimize patient delays. Success in these efforts has earned Mercy San Juan Medical Center the designation of Comprehensive Stroke Center. In fact, Mercy San Juan Medical Center is the only Joint Commission-certified Comprehensive Stroke Center in Northern and Central California outside of the Bay Area.



George Luh, MD

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## The Basics of Concussion Management

Kenneth Cheung, MD

With the fall sports season and the school year, it’s an ideal time to review the basics of concussion management both for the field and the classroom.

A concussion is a clinical syndrome that results from a biomechanical alteration of the brain. Symptoms are not always apparent at the time of the injury, posing a diagnostic challenge for even the most experienced physician. Anyone suspected of having a concussion should be removed from the field of play for further evaluation and not return to physical activity until cleared by a physician trained in concussion management. Remember: When in doubt, sit them out!

But once they’re out, how do you get them back onto the field? Or more importantly, how do you get them back into the classroom?

The good news: The majority of concussions resolve within a month, but every person is different, and there are a number of factors that can affect the length of recovery. A common question is the amount of permissible activity after the injury. A recent study published in *Pediatrics* (Jan. 2015), compared two treatment groups for diagnosed concussions at a pediatric ED: either strict physical / cognitive rest for five days or the standard protocol of one to two days of rest with stepwise return to activity. The patients in the strict rest group reported more daily symptom burden and had slower recovery times compared to those who underwent the standard protocol. These results suggest that there is a benefit to finding the proper balance of rest and activity during recovery and that prolonged, strict rest can be more harmful than beneficial. On a day-to-day basis, symptom-limited activity—both physical and mental—is key

to a healthy recovery and mitigating symptom burden.

**Return to Learn:** Remember, the student-athlete’s first job should be school, not sports, and this can’t be stressed enough. All too often I see patients who have been held out of school indefinitely, as schoolwork and exams build up, along with the anxiety that comes with it. If the student can focus for 30 to 45 minutes at a time, it is appropriate to have the student attend school with academic adjustments with the help of a well-informed and understanding teacher. The educational and psychosocial benefits of being present in school is a crucial aspect of returning to the academic setting early during recovery and is possible with an individualized academic plan in place.

**Return-to-Play:** California law from January 2015 mandates that anyone diagnosed with a concussion must undergo a minimum seven day return-to-play protocol. The law also limits practices and contact during the season and offseason. Physical and cognitive rest until symptoms resolve, and then a stepwise Return-to-Play protocol (see table) is the foundation to returning an athlete to his or her sport. Ideally, baseline testing will be available, but even if not, computerized neurocognitive tests can provide useful information in clearing an athlete for activity. An experienced clinician will use all available ancillary information in making Return-to-Play decisions. Concussions are a manageable injury and with proper education, a multidisciplinary approach, and an individualized treatment plan, a student-athlete can return safely to the field and the classroom in a safe and efficient manner.

Dr. Cheung will be happy to answer questions or accept referrals.



Kenneth Cheung, MD

**Table 1** Graduated Return-to-Play protocol

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
1. No activity	Symptom limited physical and cognitive rest	Recovery
2. Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity <70% maximum permitted heart rate; no resistance training	Increase heart rate
3. Sport-specific exercise	Skating drills in ice hockey, running drills in soccer; no head impact activities	Add movement
4. Non-contact training drills	Progression to more complex training drills, e.g. passing drills in football and ice hockey; may start progressive resistance training	Exercise, coordination and cognitive load
5. Full-contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6. Return-to-Play	Normal game play	

## Lesionectomy for Intractable Epilepsy

Jesse D. Babbitz, MD, FAANS

Epilepsy is a common neurological disorder that affects approximately 50 million people worldwide. Anti-epileptic drugs (AEDs) are the mainstay of treatment in most cases. However, up to one-third of new-onset epilepsy may prove to be medically refractory with an estimated 5,000,000 epilepsy surgery candidates in the world. Medically intractable or drug-resistant epilepsy has been operationally defined as failure of adequate trials of two tolerated and appropriately selected and dosed anti-epileptic drugs (whether as monotherapies or in combination) to achieve sustained seizure freedom.

In properly selected patients, surgery can control seizures, reduce costs of medical care, and improve quality of life.

Temporal lobe epilepsy is the most common form of medically intractable epilepsy and comprises about 80% of epilepsy surgeries with 60 to 80% of patients gaining complete seizure-freedom.

The treatment of epilepsy with surgery is founded on the idea that removal, lesioning, or disconnection of a localized epileptic region of the brain will result in cessation or reduction in seizures. There are many diagnostic methods that can be utilized to identify the epileptogenic zone, including MRI, video-EEG recordings, single-photon emission computed tomography, and magnetoencephalography.

Modern neuroimaging, especially magnetic resonance imaging (MRI), has had a profound effect on outcomes related to the surgical treatment of seizures. Epileptogenic structural lesions generally have a high rate of seizure reduction with surgical resection.

Lesional epilepsy has been estimated to represent between 20% and 30% of cases with medically intractable seizures.

Based on a recent meta-analysis of the literature, the overall odds of seizure freedom after surgery appear to be two to three times higher in the presence of a lesion on histopathology or MRI versus non-lesional epilepsy.

### Typical etiologies of lesional epilepsy and treatment

Lesions frequently associated with seizures include cavernous malformations, arteriovenous malformations, cortical dysplasia, and areas of cerebral ischemia from traumatic brain injury or strokes.

More than half of all brain tumors, especially low grade tumors, are associated with epilepsy, and approximately 30% of tumor-associated epilepsy is medically intractable.

Epileptic seizure incidence varies according to tumor location and histopathology. Low-grade tumors frequently are more epileptogenic than high-grade tumors. Most intrinsic brain tumors associated with long-standing, intractable epilepsy are low grade and indolent.

Gangliogliomas are rare tumors, but they comprise up to 40% of lesional epilepsy. Resection of these tumor results in a 63% to 100% rate of seizure-freedom. They occur most frequently in the temporal lobe and less often in the frontal lobe and other loci in the central nervous system.

Dysembryoplastic neuroepithelial tumors (DNET) are WHO Grade I tumors, usually in the cortex of the mesial temporal lobe, affecting children and young adults with long-standing, medically refractory epilepsy.

Other tumors commonly associated with medically refractory seizures include pleomorphic xanthoastrocytomas, diffuse astrocytomas, papillary glioneuronal tumors (PGNT), oligodendrogliomas, and extraventricular neurocytomas.

In general, with lesional epilepsy, circumscribed lesions in non-eloquent cortex can be gross totally resected with seizure-free rates approaching 70% to 90%, depending on the pathology. Surgical success rate can be reduced by involvement of eloquent cortex, multifocal or poorly-circumscribed pathology, or longer duration epilepsy.

Many patients become seizure-free with simple resection of the structural lesion. Sometimes it is necessary to resect the lesion and surrounding epileptogenic cortex to achieve better seizure control. This can be accomplished using either acute intraoperative electrocorticography (EcoG) or with chronic extraoperative intracranial recordings.

Early patient referral and the multi-disciplinary evaluation afforded by the Mercy Epilepsy Center can optimize patient outcomes in this challenging and gratifying area of medicine.

Mercy Epilepsy Center is designated as a Level IV Epilepsy Center by the National Association of Epilepsy Centers.



Jesse D. Babbitz, MD, FAANS



## Tips to Clinically Distinguish Seizure from Parasomnia

Robert Dias, MD

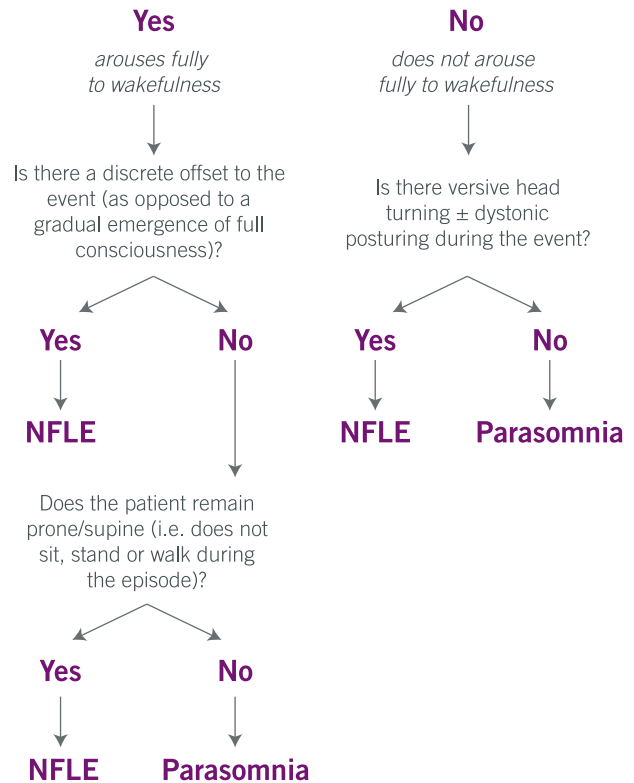
Strange events which occur during sleep may leave the doctor wondering if a patient is having seizures or some other type of sleep phenomenon. Nocturnal paroxysmal disorders include parasomnias, paroxysmal movement disorders, migraine, psychological disorders, and epilepsy. Distinguishing parasomnias from epilepsy may be challenging without the use of video-EEG monitoring and/or polysomnography, particularly when sleep and seizure disorders co-occur. Non-Rapid Eye Movement (NREM) arousal parasomnias include confusional arousals, somnambulism/sleepwalking, and sleep terrors, and at times a mixture of these may be present. Nocturnal frontal lobe epilepsy (NFLE), in particular, may have variable clinical manifestations including events with a predominant autonomic component, such as screaming, that can appear similar to a sleep terror. Sleep terrors occur in about 15 percent of children, usually between the ages of 4 and 12 years old, and typically involve abrupt awakenings from sleep with a loud scream, agitation, flushed face, sweating, tachycardia, with no recall of the event.

Derry et. al reviewed semiological features of 120 events on video-EEG monitoring in 44 subjects (SLEEP, Vol. 32, No. 12, 2009), and identified clinical features to help distinguish parasomnia from epilepsy (NFLE). The following decision tree correctly clinically identified parasomnia from NFLE in the majority (94%) of events.

In differentiating a sleep terror from a frontal lobe seizure, both of which may involve screaming and crying out, a clear sudden end to the behavior as well as a lack of interaction are more suggestive of a seizure rather than parasomnia.

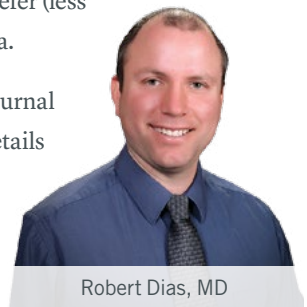
*Postictal behavior may also mimic a parasomnia, and the onset of a seizure out of sleep may initially appear like a parasomnia, such as a confusional arousal, highlighting the utility of video-EEG monitoring to help delineate.*

### Does the patient clearly arouse fully (i.e. to normal wakefulness) at the end of the episode?



Postictal behavior may also mimic a parasomnia, and the onset of a seizure out of sleep may initially appear like a parasomnia, such as a confusional arousal, highlighting the utility of video-EEG monitoring to help delineate. An expanded EEG montage on polysomnography can also be beneficial in cases involving reported parasomnia. NREM arousal parasomnias typically arise out of slow-wave/deep sleep (NREM Stage 3) as compared to seizures which typically occur out of light sleep (NREM Stage I, 2). The duration of a seizure is also typically briefer (less than 2 minutes) relative to a parasomnia.

In summary, accurate diagnosis of nocturnal behavioral events is possible through details of the history, clinical features, and in some cases with video-EEG monitoring and polysomnography.



Robert Dias, MD

## MS Patients Get Multi-disciplinary Gait Clinic

Albert Hwang, MD

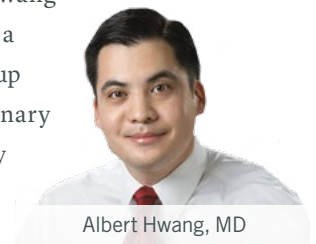
Multiple sclerosis (MS) is typically a chronic progressive neurologic disease that leads to impairments in functional mobility over time. Many MS patients have difficulty walking and transferring due to a variety of reasons including generalized fatigue, muscle weakness, muscle spasticity, impaired sensation, and lack of proprioception. Until now, these patients would seek care from a variety of clinical providers to have their mobility issues assessed. These providers would include primary care physicians, physical therapists, neurologists, and physiatrists (a physical medicine and rehabilitation specialist). Care was often fragmented and sometimes patients would receive conflicting recommendations regarding how best to have their needs addressed.

In November 2014, neurologist John Schafer, MD and physiatrist Albert Hwang, MD started a multi-disciplinary clinic at the Mercy Outpatient Rehabilitation Center to address the needs of multiple sclerosis patients with mobility issues. The doctors collaborate with physical therapists as well as a licensed orthotist on site to address patient needs. The clinic is held once a month, and is the first outpatient clinic at Mercy Medical Group to include providers of various disciplines evaluating and treating the patient simultaneously. The clinic currently focuses on the mobility needs of multiple sclerosis patients, but may expand to other neurologic disorders in the future.

Having the expertise of neurology, physical medicine, physical therapy, and orthotics in the same place at the same time means that patients get a variety of inputs regarding how best to treat their mobility issues. The four providers function as a team, each with their own areas of expertise with regards to disease management and maximizing function.

Recommendations can be made for adaptive equipment such as wheelchairs, walkers, and canes. Patients with spasticity can be evaluated for oral anti-spasmodics, botulinum toxin injection or even considered for intrathecal baclofen pump placement. Patients with lower extremity weakness can try on orthotics and be custom fitted while a licensed physical therapist observes how these modifications improve mobility. Patients can be referred directly to begin a physical therapy course, and that course of treatment can be custom tailored to their functional impairments.

Exposure to specialist colleagues in this collaborative setting also gives the providers the opportunity learn from each other and broaden their fund of knowledge. Drs. Schafer and Hwang hope that their clinic can serve as a model within Mercy Medical Group for other outpatient multi-disciplinary clinics in order to service a variety of chronic diseases.



Albert Hwang, MD

## MS Achievement Center

John Schafer, MD

The favorite day of the week for 60 people is the day they go to the MS Achievement Center in Citrus Heights. Founded with a very generous grant to Mercy Foundation from the Conrad N. Hilton Foundation, the MS Achievement Center is a wellness program which provides long term physical, cognitive, and social opportunities to those with disability from multiple sclerosis. To say that the Center is a life-changing experience for many is not an exaggeration. A man whose life has been dramatically affected by MS recently told me, “in the 15 years I’ve had MS, this is the best thing that’s ever happened to me!”

Achievement Center participants attend a 5-hour program on one day a week, 20 of them each on Tuesday, Wednesday,

or Thursday. The scheduled activities include yoga, Pilates, stretching, and other exercises, all designed for each individual’s capabilities, and activities providing cognitive stimulation, recreation, and socializing. Additionally, discussions about medical or wellness topics occur regularly. Participants pay a monthly fee, which is on a sliding scale so that no one should be prevented for financial reasons from participating. Participants may continue in the program for as long as they wish. Without this program, many with disability due to MS have very limited opportunities for similar experiences.

Besides the core day program, other activities of the Achievement Center include a support partners series, a book group, and “Yoga In The Park.” Free From Falls and Cognifitness series designed by the multiple sclerosis Society are also delivered as part of the

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**MS Achievement Center—continued from page 6**

program. Commenting on the book group, one participant stated that it gave her back the joy of reading which she had lost because of the visual and cognitive challenges caused by her multiple sclerosis. A program for teens of parents with MS and half day programs in remote areas of northern California are planned.

The immense gratitude expressed by the participants is due not only to the attention to individual needs of each one but also to the community sharing of experiences. “When I come here everyone understands me and my MS,” is a frequently expressed sentiment. Unsteady walking, difficulty with speech, and wearing of a brace or using a walker, which are challenges in public, are accepted and understood by all at the Achievement Center.

An important part of wellness programs is to identify and track markers of the benefits of the program on the lives of participants. Working with The National Multiple Sclerosis Society, the Achievement Center has developed a battery of markers which are evaluated at the start of the program and periodically over time for each participant. These markers include physical and emotional factors, as well as measures of physical wellness, reflected, for example, in the number of visits to the emergency room. A cooperative project with Lumos, the

maker of Luminosity, is underway to identify other measures of cognitive progress.

As a demonstration of the Center’s success and national recognition in a short period of time, the National Multiple Sclerosis Society has chosen Sacramento as the site for its 2015 national meeting of adult day centers.

The MS Achievement Center is open to all individuals with MS, regardless of where they receive medical care. Most participants live in the immediate Sacramento area, but some come from Auburn, Placerville, and even Napa.

Expansion to larger numbers of members is being planned.

The very generous grant from the Conrad N. Hilton Foundation was the “seed” for establishing this remarkable and unique program, and Mercy Foundation is leading the campaign to provide support through the philanthropy of those who recognize its life-changing value.



John Schafer, MD

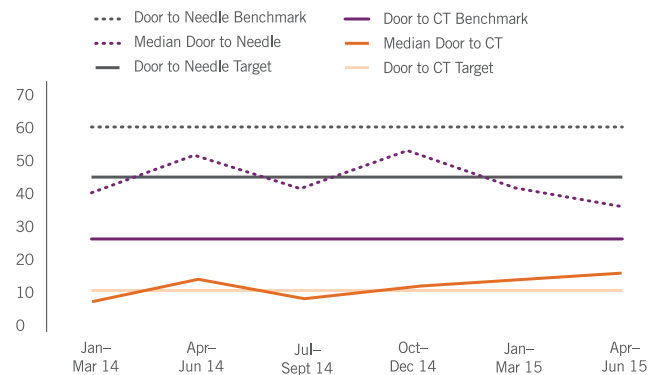
**Brain Waves**

**Dignity Health Celebrates Mercy San Juan’s Comprehensive Stroke Center Anniversary**

July 19, 2015 marked Dignity Health Neurological Institute’s first anniversary of Comprehensive Stroke Center status at Mercy San Juan Medical Center, as recognized by The Joint Commission. Mercy San Juan remains the only Comprehensive Stroke Center north of the Bay Area. In its first year as a Comprehensive Stroke Center, Mercy San Juan significantly exceeded the *Target: Stroke<sup>SM</sup> Honor Roll—Elite Plus* status by treating 92% of acute ischemic stroke patients with thrombolytic therapy within 60 minutes—compared to the goal of 75%. Mercy San Juan also achieved a 45-minute door to needle time for 67% of patients compared to the goal of 50%.

Dignity Health Neurological Institute of Northern California	Discharged FY 14	Discharged FY 15	Δ
Neurointerventional Procedures	537	544	1%
Inpatient Stroke Cases (All Types)	1,918	2,084	9%
All or None Stroke Bundle	96%	97%	1%

**Comprehensive Stroke Center t-PA Case Measures**



# CONTINUING MEDICAL EDUCATION 2015

## **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.

## **Acute Stroke and Neurocritical Care Case Conferences**

### **Mercy San Juan Medical Center**

Conference Room 2

Second Wednesday of each month  
at 5 p.m.

## **Multiple Sclerosis Case Conference**

### **Mercy San Juan Physicians Plaza**

Room 145

First Wednesday of each month at  
5:30 p.m.

## **Epilepsy Treatment: A New Frontier An Insights & Innovations Exclusive CME Event**

Thursday, November 12, 2015

5:30 to 8:30 p.m.

North Ridge Country Club

7600 Madison Avenue,

Fair Oaks, CA 95628

Register online at

[DignityHealth.org/NeuroCME](http://DignityHealth.org/NeuroCME).

The cost is free. Space is limited;  
early registration is recommended.

If you have questions, please call

916.733.6322.

If you have any questions about upcoming opportunities, contact  
[DignityHealthNeuro@DignityHealth.org](mailto:DignityHealthNeuro@DignityHealth.org) or call 916.962.8751.