

NEUROtransmitter

A PUBLICATION OF SANTA BARBARA NEUROSCIENCE INSTITUTE AT COTTAGE HEALTH SYSTEM

fall 2013



Pulmonary Critical Care

Specialists in
Neurocritical Care
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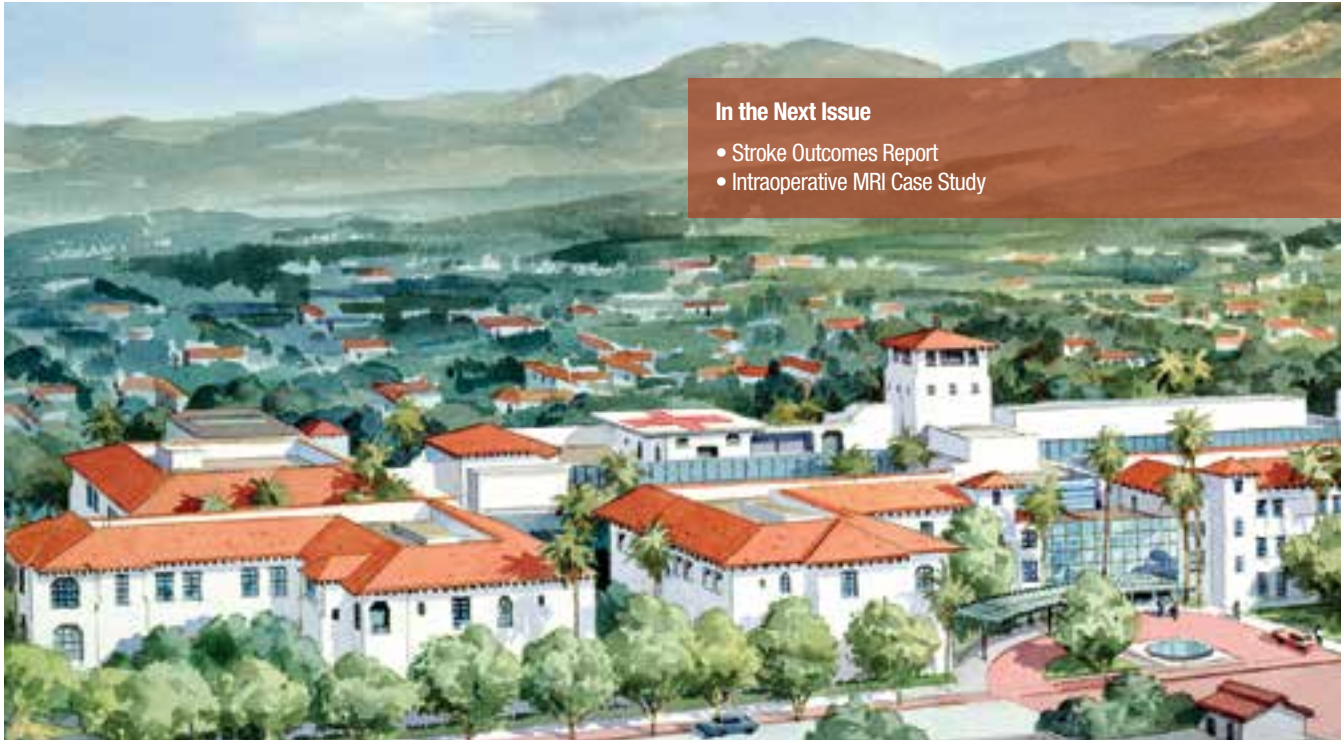
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About Santa Barbara Cottage Hospital and Cottage Health System

The not-for-profit Cottage Health System is the parent organization of Santa Barbara Cottage Hospital (and its associated Cottage Children’s Hospital and Cottage Rehabilitation Hospital), Santa Ynez Valley Cottage Hospital and Goleta Valley Cottage Hospital.

The Santa Barbara Neuroscience Institute at Cottage Health System is a physician-led initiative established to focus on medical conditions over the full cycle of care. The Institute aims to deliver the highest value to the patient by incorporating best practices, applying resources judiciously, and measuring and reporting outcomes relentlessly.

On the Cover: Coronal brain image demonstrating right temporal lobe contusion. A Licox Bolt has been placed enabling accurate measurement of brain tissue (Pbt02) and brain temperature.





Dear Colleagues,

As you may know, the 6th Annual Saving the Brain Symposium of the Central Coast will take place on Saturday, October 12, at the Fess Parker/ Double Tree Resort in Santa Barbara. This event, brought to you by the Santa Barbara Neuroscience Institute at Cottage Health System, will bring together local, regional and national experts to share their knowledge on advances in the neurosciences.

As a physician and surgeon, I have been a long-time advocate for evidence-based medicine and research, and I fully endorse this event as its Co-Medical Director. I am personally inviting you to attend this conference with the hope that the speakers will help all of us further our quest for higher quality care and optimal patient outcomes at a cost that yields the maximum value.

Our keynote speaker this year is Dr. Richard Deyo, co-author of the book *Hope or Hype*. Dr. Deyo's talk, titled "Controversies in the Treatment of Lower Back Pain," will surely spark discussion among those in our profession. Please see the back page of this magazine for a list of speakers, topics and fee.

I look forward to seeing you in Santa Barbara on October 12th.

Sincerely,

Thomas H. Jones, MD

Neurosurgeon and Medical Director
Santa Barbara Neuroscience Institute

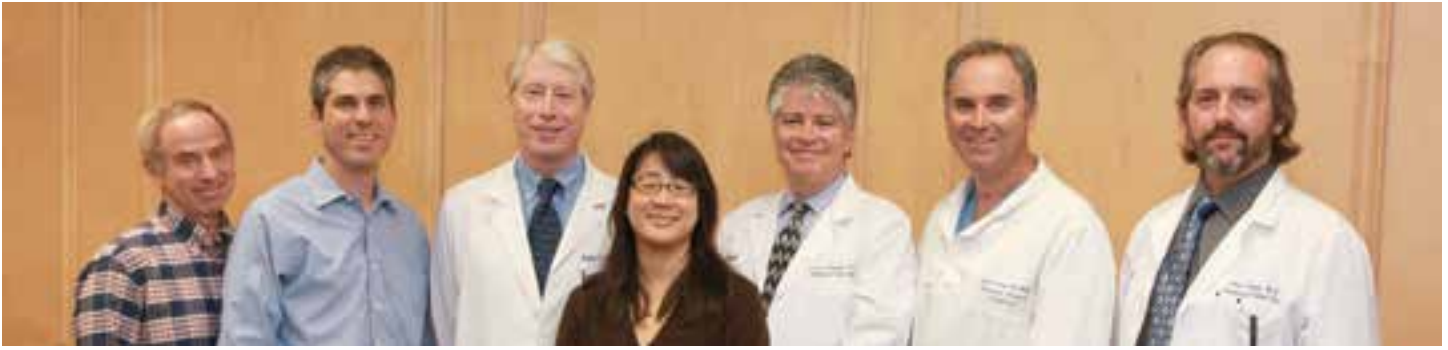
“ I am personally inviting you to attend this conference with the hope that the speakers will help all of us further our quest for higher quality care and optimal patient outcomes at a cost that yields the maximum value.”



4 The Neurocritical Care Team

Pulmonary Critical Care Specialists in **NEUROCRITICAL CARE**

The Cottage Neurocritical Care Program is a tertiary-level program that provides specialized neurovascular interventions and intensive care to patients from a wide section of California.



The Pulmonary Critical Care Team (left to right): Dr. Jeff Fried, Dr. Richard Belkin, Dr. Robert Wright, Dr. Ann Lee, Dr. Eric Schroeder, Dr. Jeffrey Sager and Dr. David Zisman. Not pictured: Dr. Jeffrey Kupperman, Dr. Ronald Ungerer and Dr. Marta Sovilj.

Patients requiring emergent care for subarachnoid hemorrhage and ischemic stroke are frequently flown by helicopter to Santa Barbara Cottage Hospital. Subsequent intensive care of these patients is a complex and multi-disciplinary process involving not only neurosurgeons, nurses and respiratory therapists but also the expertise of physicians trained in pulmonary and critical care medicine. These doctors, also known as intensivists, include **Richard A. Belkin, MD, Jeffrey Fried, MD, Ann Lee, MD, Jeffrey S. Sager, MD, C. Eric Schroeder, MD, Robert S. Wright, MD, and David Zisman, MD.** All are board certified in critical care medicine. The coordination of care by intensivists is integral to achieving excellent outcomes for critically ill neurological patients.

One of the major problems encountered by our team is subarachnoid hemorrhage. Subarachnoid hemorrhage is most frequently due to a rupture of a weakened blood vessel wall providing circulation to the brain. Such weaknesses are known as aneurysms. Other common causes include arteriovenous malformations and fibromuscular dysplasia. It is the role of the neurosurgeon or neurointerventionalist to stop the bleeding by specialized catheter procedures. Frequently, the aneurysm site is embolized with small coils that prevent further bleeding. In other instances, drugs are administered directly into the vessels to dissolve clots. At other times, the clot may actually be physically extracted. Time is of the essence for all these procedures. However, even with the most expedient and timely procedures, it is anticipated that the brain can become quite injured. The care of the patients after these initial procedures is key to their survival. The intensivists at Santa Barbara Cottage Hospital play a crucial role in their care.

Brain injury is accompanied by brain swelling. Because the skull is a rigid structure, the pressure from the swelling can further damage the brain. At our institution, therapeutic hypothermia is a key treatment to improving the neurocritical patients' outcome. These patients are intentionally paralyzed with specialized medications and a cooling catheter is placed into a large vein. Because the patients are paralyzed, a mechanical ventilator is used to breathe for them through a tube placed in the trachea. Their body temperature is lowered and maintained for one or two weeks until brain swelling resolves. Much like an ice pack on a bruised extremity, this cooling can lessen damage to the brain. However, these maneuvers are complicated and have the potential to cause short-term problems such as pneumonia, severe lung injury known as acute respiratory distress syndrome (ARDS), electrolyte disorders and bleeding. Therapeutic hypothermia is also used to protect the brain from injury after certain types of cardiac arrest and is available at Santa Barbara Cottage Hospital.

The control of ventilation is essential in neurocritical care patients. Pulmonary intensivists work to achieve a delicate physiological equilibrium, balancing ventilation to achieve carbon dioxide (pCO₂) levels that reduce brain swelling, while administering large amounts of fluid to maintain optimal blood pressure. The lungs can become injured from these fluid challenges because the patients are paralyzed and unable to mobilize and expectorate their own secretions. This sometimes leads to the competing priorities of protecting the brain vs. adequate ventilation and the health of the lungs. Consequently, pulmonary edema, a form of congestive heart failure, and ARDS are frequent complications. The pulmonary intensivists perform bronchoscopy to remove and culture secretions in order to determine appropriate antibiotic treatment for pneumonias. For pulmonary edema and ARDS, the intensivists use traditional as well as creative and alternative ventilation modalities to keep patients alive; such maneuvers are important to prevent complications such as collapsed lungs.

The pulmonary and critical care specialists collaborate with the neurosurgeons, neurologists, nurse practitioners, nurses, respiratory therapists, dietitians and other members of the healthcare team to coordinate daily care of the patients. During rounds, radiographs are reviewed and nutrition and other physiological needs such as bowel function are assessed so that the patient's care is individualized to optimize his or her recovery.

Approaching a Crossroads

The care of neurocritical care patients by our pulmonary and critical care specialists is not only important, but it is relatively uncommon. While critical care physicians play a unique role and many studies have indicated that their expertise is important, it is estimated that only about 20 percent of the intensive care units in the United States are staffed with critical care specialists. The demand for critical care specialists is rising, yet the number of these trained specialists is not anticipated to keep up with demand. In fact, the Society of Critical Care Medicine estimates that by 2020 there will be a 35 percent shortfall of trained specialists nationally. As such, we have been fortunate at Cottage Hospital to have so many well-trained critical care specialists. However, the demand for their services is expected to increase as advancing technologies for the care of critically ill patients evolve. It will be important to have the services of these doctors available for the future.

To meet the specialists at Santa Barbara Neuroscience Institute at Cottage Health System, visit www.sbni.org. To refer a patient, please contact the transfer center at 1-888-MY-CAL-NEURO.

The Ever-evolving Role of the Advanced Practice Nurse, From Physician Extender to Midlevel Intensivist

by Veronica Moreno, ACNP-BC, neurosciences



Veronica Moreno, ACNP-BC

The advanced practice nurse (APN) role was developed during a time of major healthcare reform, physician shortages, and both societal and economic need. The APN has been at the forefront of these changes and evolved as a profession into an integral part of the modern healthcare system.

Today the APN is a registered nurse with a master's, post-master's or doctoral degree. APNs are certified by a specialty organization after passing a national certification exam. They diagnose, treat, teach and counsel patients and most have prescriptive authority.

The four main groups of APNs are the nurse practitioner (NP), the certified nurse specialist (CNS), the certified nurse anesthetist (CRNA) and the certified nurse midwife (CNM). The focus of this article is on the development of the NP role and the changes in health care that led to the development.

Historical Context

The NP role has evolved from the early portrayal of a physician extender to a modern-day midlevel intensivist—the driving force in the modernization of medicine, healthcare reform, economic forces and the needs of society. Currently, 115,000 NPs are practicing in the United States.

In the late 1950s and early 1960s, there was an increase in physician specialization. A number of physicians left primary care, resulting in shortages especially in rural and medically underserved areas. In 1965, the Medicare and Medicaid program increased coverage and the availability of medical care for low-income women, children and the elderly. The APN's role was developed to meet the increased need for healthcare delivery.

A nurse and a physician created the first NP training program. In 1965, Loretta Ford and Henry Silver developed the first NP program in Colorado. The focus was on health promotion, disease prevention, and the health of children and families.

During the 1970s, the APN profession was further defined and legitimized. The American Nurses'

Association (ANA) defined and published guidelines that addressed scope of practice, skills and continuing education requirements. Furthermore, there was documentation of the increased availability of primary care, and both patient and physician satisfaction elevated the profession. Studies conducted in the 1980s evaluated outcomes and the delivery of health care by APNs. One randomized trial in *JAMA* supported the hypothesis that primary care outcomes do not differ between NP and physician healthcare delivery.

In the late 1980s to early 1990s, the biggest change occurred that affected APN education. The American Nurses Credentialing Center (ANCC) changed the requirement to sit for a national certification exam to graduate-level education and preparation. Prior to this, APN education took place through multiple non-degree programs of varying length. A registered nurse could attend one of the certification programs as a means to enter into practice. Many HMOs dominated by physicians held certificate programs with the goal of producing low-salaried mid-level practitioners to function as physician extenders.

The Move to NP Sub-specialization

The first group of acute care nurse practitioners (ACNP) was certified in 1995. This newest subspecialty was developed during a time when teaching and academic hospitals were forced to cut back on residency hours. In 2003, the first national mandate to limit resident hours was instituted by the Accreditation Council for Graduate Medical Education. Then in 2011, call restrictions were implemented for first-year residents.

Following these new mandates, non-physician providers have been utilized in many healthcare systems to meet

the needs of patient care. Although other NPs with a background in family medicine, pediatrics or gerontology practice in hospital settings, only ACNPs are specially trained in critical care and the management of critically ill ICU patients.

ACNP specialty areas of practice include critical care, trauma, surgery, hospitalist, neurosurgery and interventional radiology, to name a few. According to the ANCC, approximately 10,000 ACNPs are currently certified in the United States.

Today, as hospitals are forced to alter current practices and develop new models of care, the idea of an inter-professional practice approach to care has moved to the forefront. APNs are among the various practitioners who have proven they are capable of providing high-quality, cost-effective care. Hospitalized patients are sicker than in the past, and patients in intensive care have increasingly more complex conditions. Many ICU patients require teams of highly trained specialists to care for them. This is especially true for patients in the modern neurocritical care unit.

At Cottage Health System

At Santa Barbara Cottage Hospital, neurocritical care patients occupy part of the surgical intensive care unit. The multidisciplinary team of professionals who care for these patients includes NPs, pulmonologists, RNs, respiratory therapists, dietitians, and physical, occupational and speech therapists, to name a few. Caring for these complex patients would be nearly impossible without this team.

Santa Barbara Cottage Hospital has employed three ACNPs who are an integral part of the neurosciences team. Working in a collaborative practice with a dedicated group of pulmonary intensivists, the NPs guide the daily management of hospitalized acute and critically ill neuro ICU patients.

The ACNPs work 12-hour shifts, three days per week, managing an average of 15 to 18 patients daily. Most of the patients are in intensive care and among the sickest patients in the hospital.

The growth of the neuroscience services of Santa Barbara Cottage Hospital has required expansion and ongoing development of the inter-professional team that cares for these patients. The ACNPs work closely with the attending neurosurgeon and provide comprehensive patient care from admission through discharge. In addition to the day-to-day management of patients, ACNP duties include attending and presenting patients during multidisciplinary rounds, advanced procedures such as central line and arterial line placement, lumbar puncture, and specialty physician consultation.

Scope of Services

The daily management of the complex neurocritical care patient requires in-depth knowledge of critical care, pharmacology, anatomy and pathophysiology pertaining to the neurosciences. Furthermore, an understanding of general neurosurgical and neuroendovascular procedures and postoperative care is essential to patient

management. The ACNP uses standardized procedures and hospital protocols in the management of acutely ill hospitalized patients. The maintenance of blood pressure, fluids, electrolytes, F_{iO_2} , P_{aO_2} , P_{CO_2} , sedation, paralytics, anticoagulation and body temperature within certain parameters is of key importance for good outcomes. The primary goal of neurocritical care is the prevention of secondary brain injury; the treatment and management of neurocritical care patients varies significantly depending on the patient's disease process.

Historically, pulmonary critical care physicians and intensivists have cared for patients in the ICU. The Committee on Manpower for the Pulmonary and Critical Care Societies has estimated the need for intensivists will fall short of the demand by as much as 22 percent by 2020.

According to the 2010 Institute of Medicine (IOM) report, *The Future of Nursing*, "millions more patients are expected to access healthcare services under the federal Affordable Care Act, [and] APRNs should be prominent in providing that care."

As we sit on the brink of yet another major healthcare reform, the APN will be vital in providing care and filling healthcare delivery gaps. The APN has evolved from simply being an extension of the physician into a mid-level provider and necessary component of the inter-professional healthcare team. The modern APN is a highly educated individual capable of managing acutely ill hospitalized patients and providing high-quality, cost-effective health care as a midlevel intensivist.

For more information about Santa Barbara Neuroscience Institute at Cottage Health System, please visit our website at www.sbni.org.



Cottage Health System advanced practice nurses: Veronica Moreno, ACNP, CNRN; Emily Rorden, ACNP-BC, CNRN; Martha Serrato, ACNP-BC

“Together in Brain Injury Support” HELPS BRAIN INJURY SURVIVORS AND CAREGIVERS

A collaboration between the Jodi House Brain Injury Support Center and the Coast Caregiver Resource Center (CCRC) called “Together in Brain Injury Support” bridges the gap between survivor and caregiver needs.

“So often, caregivers’ needs are invisible in the healthcare system. No one asks, ‘How are you doing?’ or ‘How can we help you do this job?’ **Having someone recognize their needs is such a wave of relief for caregivers.**”

—Mary Sheridan, MA, LMFT,
executive director, Coast Caregiver
Resource Center



Each organization brings specific strengths to the partnership. One of 11 publicly funded regional Caregiver Resource Centers, CCRC (a program of Cottage Rehabilitation Hospital) provides education, assessments, direct services and referrals in response to the needs of those who care for survivors of brain injury. Jodi House, a non-profit organization that helps brain injury survivors rebuild their lives, focuses on the needs of the survivors themselves.

“Our mission is to provide support to unpaid caregivers, such as friends, family members or others in the community who are caring for someone with an adult neurological impairment,” says Mary Sheridan, MA, LMFT, executive director, CCRC. “Because brain impairment often restricts a person’s ability to care for himself or herself, we assess the strengths and needs of family members or other informal caregivers who find themselves in the role of providing assistance.”

Based on an initial needs assessment, CCRC provides a range of potential support, which may include caregiver support groups, consultation and counseling, information and education, respite care, and retreats.

“About 75 percent of long-term care is provided by unpaid family or friend caregivers at home in the community rather than in a facility,” Sheridan says. “Support often comes at great cost to the person providing care. That cost can take many different forms, including financial burden, physical toll and emotional stress.

“At CCRC, we help caregivers identify the resources they already have, not only financial assets but also emotional and practical strengths they may not realize,” she continues. “Then we look at their needs and help them identify resources in the community they can draw on, as well as specific services we can offer.”

An Environment of Support

Working in partnership with CCRC, Jodi House “squares the circle” in terms of ensuring that all families affected by brain injury have the support they need.

Jodi House offerings include a clubhouse day program as well as a variety of therapeutic programs, including cognitive skill building, communication and memory strategies, art and music therapy, exercise, community outings, and prevocational training.

Resources

For additional information or to refer a brain injury survivor, contact:

Jodi House Brain Injury Support Center
(805) 962-3600, ext. 14
Email: jodihouse@gmail.com
www.jodihouse.org

For more information or to refer a person who is caring for a brain injury survivor in Santa Barbara, Ventura or San Luis Obispo Counties, contact:

Coast Caregiver Resource Center
(805) 962-3600, ext. 14 or
(888) 488-6555, ext. 14 (toll-free out of area)
Email: info@coastcrc.org
www.coastcrc.org

For access to additional services available to caregivers from local centers throughout California, visit:

California Caregiver Resource Centers
www.cacrc.org



Robert Harbaugh, MD, neurologist and neurophysiologist (center), spoke on the “Ecology of Caregiving” at Coast Caregiver Resource Center’s 25th Anniversary Celebration held at Cottage Rehabilitation Hospital in Santa Barbara. Also pictured: Melinda Staveley, MS, vice president of Cottage Rehabilitation Hospital (right), and Mary Sheridan, MA, LMFT, executive director of Coast Caregiver Resource Center (left). CCRC has provided services to family caregivers in Ventura, San Luis Obispo and Santa Barbara counties for more than a quarter of a century.

“We work with about 100 local agencies to obtain resources and referrals for rehabilitation, education, mental wellness, recreation, and community and social services,” says Gayle A. Cummings, MS, LEP, and a member of Jodi House board of directors. “Isolation, the biggest stressor for brain injury survivors, can lead to divorce, depression and suicide. Our program’s key focus is social integration in a safe, nurturing environment among other brain injury survivors. We also participate in return-to-work programs and have had success in job placements.”

Although newly formed, the Together in Brain Injury Support partnership is already raising awareness about brain injury with a series of public educational workshops offered at Jodi House in Santa Barbara. Topics include “Building Caregiver Resilience” and “Coping With Brain Injury Changes.”

Another key aspect of Together in Brain Injury Support is the coordination of referrals between Jodi House and CCRC. Hospital discharge is a stressful, often overwhelming, time for patients and caregivers alike. As a result, several referrals may be necessary—with information often arriving at different points in time—before survivors and caregivers recognize, reach out and access all the services that are available to them. The new partnership makes navigating those sources of help just a little easier.

Serving different groups, both CCRC and Jodi House reach out to inform brain injury survivors and caregivers of the services available to them and direct them to the appropriate resources after hospital discharge.

- **CCRC** serves caregivers (family, friends and community members) of people suffering from neurological impairment.
- **Jodi House** serves the needs of persons 18 years or older who suffered either acquired or traumatic brain injury after age 13. Clients must be able to participate in activities and have basic skills for daily living.

Both organizations offer their services for free, although donations are accepted. Physicians, discharge planners and members of other community organizations may refer patients to both CCRC and Jodi House. Individuals may also access these services without a referral.

To learn more, please contact CCRC at (805) 488-6555, ext. 14, or Jodi House at (805) 563-2882.

“Brain injury can happen to anyone in an instant, and it lasts forever. In Santa Barbara County, more than 50 percent of our homeless population suffers from brain injury and 39 percent of our brain injury survivors are unemployed. At Jodi House, **we help brain injury survivors return to work, find housing and successfully reintegrate into our community.**”

—Gayle A. Cummings, MS, LEP, and a member of Jodi House board of directors



John Park, MD, PhD

Maximizing Surgical Resection of Glioblastomas—the Intraoperative MRI

by John Park, MD, PhD, neurosurgeon

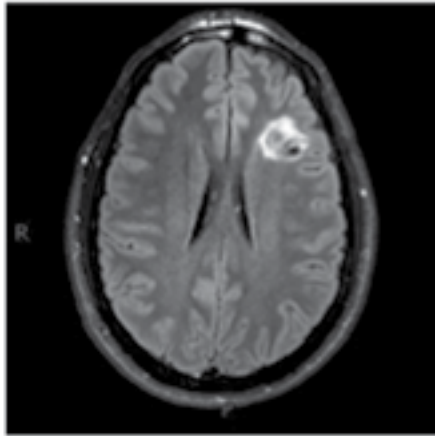
Gliomas are the most common primary tumors of the brain. They arise from the neoplastic transformation of neural stem cells or of glial cells such as astrocytes or oligodendrocytes.

Histological criteria defined by the World Health Organization (WHO) are used to grade the relative malignancy of gliomas along a progressive four-point scale. “Pilocytic astrocytomas,” which generally occur in children, are considered grade I or benign and complete surgical resection is the treatment of choice as it is often curative. The most common grade II tumors are “low-grade astrocytomas” and “oligodendrogliomas.” While these tumors are also considered benign, they can progress over time to higher grades. Complete surgical resection, if possible, is the treatment of choice for grade II tumors as well. Grade III tumors are considered malignant and the most common examples are “anaplastic astrocytomas” and “anaplastic oligodendrogliomas.” Surgical resection followed by adjuvant radiation therapy and chemotherapy is recommended. The most common and malignant glioma is the “glioblastoma multiforme” (a.k.a. “glioblastoma” or “GBM”). Glioblastomas are classified as grade IV tumors.¹

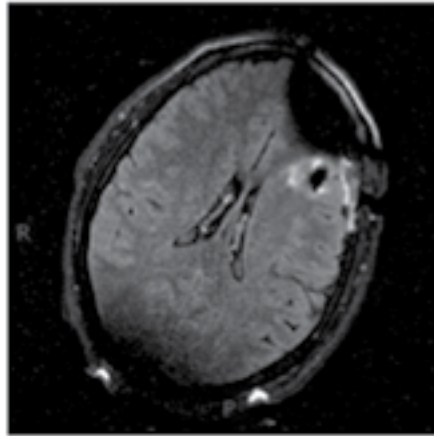
The initial treatment for a brain lesion suspected of being a glioblastoma on a magnetic resonance imaging study is a surgical procedure such as a biopsy, a partial resection or a gross total resection to establish a histologic diagnosis. Following confirmation that the lesion is a GBM, the current standard of care is the concurrent administration of radiation therapy and temozolomide chemotherapy followed by the administration of temozolomide alone. A randomized, controlled trial comparing radiation alone to the combination of radiation and chemotherapy demonstrated the superiority of the latter.² In contrast, there is a lack of consensus on the best initial surgical management of patients, in part due to the absence of

a prospective trial demonstrating the efficacy of one procedure over the others. Several retrospective studies have, however, shown a clear association between greater extent of tumor resection and increased survival as well as more favorable response to chemotherapy. One of the initial studies to show this found that patients who had $\geq 98\%$ of their tumors resected survived longer than those who had $< 98\%$ removed. Subsequent studies have confirmed these results and have shown that removal of even $> 78\%$ is beneficial to patients.³

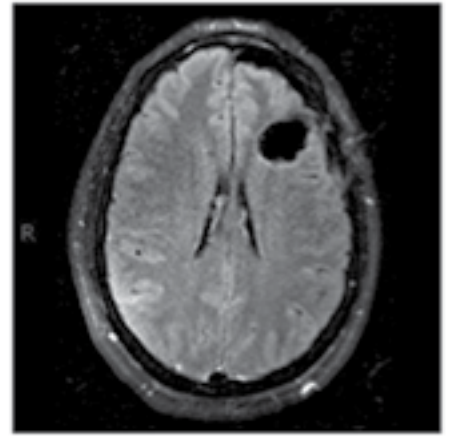
Among the tumor characteristics leading to partial rather than gross total resection are proximity to eloquent brain regions, diffuse or multifocal nature, deep white matter location and large size. Tumors located directly in motor, speech, or visual areas generally cannot be completely resected without exacerbating existing neurological deficits or inducing new ones. Tumors located in close proximity to such functionally important areas may, however, be gross totally resectable with the aid of sophisticated intraoperative monitoring techniques such as cortical and subcortical motor mapping, productive and receptive speech testing, and visual evoked potential analysis. Another predisposing factor to the partial resection of a GBM is the lack of a distinct tumor-brain interface. Although the appearance and texture of frank tumor tissue significantly differs from that normal brain tissue, it is sometimes difficult to determine where one transitions into the other. The use of intraoperative MRI scanning allows the surgeon to periodically monitor the extent of tumor resection to ensure that a maximal amount of tumor tissue is removed prior to the completion of the operation



Pre-operative T1-weighted contrast enhanced axial MRI image shows a heterogeneously enhancing mass in the left frontal lobe that is suspicious for a malignant primary brain tumor.



A first intraoperative T1-weighted contrast enhanced axial MRI image shows a central resection cavity surrounded by a rim of enhancing tumor tissue. Shadows in the front and back of the head are due to artifacts caused by the surgical head-holder.



A second intraoperative T1-weighted contrast enhanced axial MRI image shows gross total resection of the enhancing tumor tissue.

and the transport of the patient out of the operating room.

The following case illustrates the use of the intraoperative MRI to achieve a gross total resection of a glioblastoma in the left frontal lobe. Mr. G. is an otherwise healthy 55-year-old male without any significant previous medical history. Over the past few weeks, he had been having intermittent headaches, which were relieved with acetaminophen. On the day of presentation, he was riding his bicycle when he developed uncontrollable twitching of his right hand and inability to speak. The episode was witnessed by his wife and lasted approximately 10 minutes in total.

His wife brought him to the emergency room where an evaluation was performed. He denied any headaches, speech difficulties or weakness. His review of systems was negative, and he reported no recent travel out of the area. His general medical examination was within normal limits and on neurological testing, his mental status, cranial nerves, motor, sensory, cerebellar and reflex examinations were all non-focal. An MRI of the brain revealed a lesion in the left frontal lobe that heterogeneously enhanced with gadolinium contrast on T1-weighted imaging and that was hyperintense to brain on T2-weighted imaging. The lesion was suspicious for a primary brain tumor and a gross total resection was recommended given its location in the left frontal lobe. After an understanding the risks and benefits, the patient consented to surgery in the intraoperative MRI suite.

The patient was brought into the intraoperative MRI suite and general anesthesia was induced. He underwent a left frontal craniotomy with initial use of a standard intraopera-

tive image guidance system. All grossly abnormal tissue was resected and hemostasis was achieved within the resection cavity. An intraoperative MRI scan was performed which revealed residual enhancing tumor tissue around the periphery of the resection cavity. Using this new intraoperative MRI scan as a guide, additional tumor tissue was resected. A second intraoperative MRI scan was performed which revealed that the tumor had now been gross totally resected. The dura was closed, the craniotomy bone flapped was secured in place, and the galea and scalp were closed. The patient was awakened from general anesthesia, extubated, and taken to the intensive care unit. The patient was discharged to home on post-operative three without any complications. Histologic analysis of the tumor indicated that it was a glioblastoma and the patient subsequently underwent outpatient radiation and temozolomide chemotherapy.

To meet the specialists at Santa Barbara Neuroscience Institute at Cottage Health System, visit www.sbni.org. To refer a patient, please contact the transfer center at 1-888-MY-CAL-NEURO.

References:

- ¹ Louis DN, Ohgaki H, Wiestler OD, et al. The 2007 WHO classification of tumours of the central nervous system. *Acta Neuropathol* 2007;114:97-109.
- ² Stupp R, Mason WP, van den Bent MJ, et al. Radiotherapy plus concomitant and adjuvant temozolomide for glioblastoma. *N Engl J Med* 2005;352:987-96.
- ³ Eyupoglu IY, Buchfelder M, Savaskan NE. Surgical resection of malignant gliomas—role in optimizing patient outcome. *Nat Rev Neurol* 2013;9:141-51.



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Update on Management of Malignant Glioma

Timothy Cloughesy, MD
UCLA Neuro-Oncology Program

State of the Evidence: Key Controversies in the Treatment of Lower Back Pain

Richard A. Deyo, MD, MPH
Oregon Health & Science University

The Evolving Role of the Nurse Practitioner in the Neuroscience Intensive Care Unit

Krista Garner, MSN, RN, ACNP
Emory University Hospital

Cost of Saving the Brain After Traumatic Brain Injury

David Hovda, PhD
UCLA Brain Injury Research Center

Peripheral Nerve Tumor: To Operate or Not – That is the Question

Michel Kliot, MD
UCSF Medical Center

From Bench to Bedside: The Future of the Diagnosis and Management of Dementia

Kenneth Kosik, MD
UCSB, Molecular Cellular & Development Biology

Case Studies in Brain Tumor Surgery Benefiting from Intraoperative MRI

John Park, MD, MPH
Neurosurgical Oncology,
Santa Barbara Neuroscience Institute
at Cottage Health System

Neurocritical Care – Some Interesting Case Studies

Emily Rorden, MSN, RN, ACNP
Santa Barbara Neuroscience Institute
at Cottage Health System

Stroke and Sleep Apnea, Dangerous Bedfellows

Hsien C. Young, MD
Sansum Clinic

Minimally Invasive Surgery for Intracerebral Hemorrhage

Alois Zauner, MD
Santa Barbara Neuroscience Institute
at Cottage Health System

On behalf of Santa Barbara Neuroscience Institute at Cottage Health System, you are cordially invited to attend

saving the brain

The 6th Annual Neuroscience Symposium of the Central Coast featuring nationally recognized guest speakers, along with experts in the Neurosciences from Santa Barbara Cottage Hospital

Saturday, October 12, 2013

7:00 AM to 4:15 PM

Fess Parker's DoubleTree Resort

633 East Cabrillo Boulevard

Santa Barbara, CA 93103

register online

at www.sbni.org or email sbni@sbch.org