

# New Jersey's Primary & Comprehensive Stroke Centers

*Early one cold morning you are called for a 75 year-old man whose wife states he was preparing coffee when suddenly the cup dropped from his right hand. Since that occurred 15 minutes ago, she states he has been "speaking gibberish." You note he is not moving his right side and does not follow commands. What is your next step, and where would you take him?*

**T**here are an estimated 750,000 strokes with 200,000 deaths each year in the United States and these numbers will undoubtedly increase as the population continues to age. The last decade has seen a significant leap in the diagnosis and treatment of stroke. These gains can be largely attributed to a greater attention to stroke prevention and prompt treatment of acute symptoms.

Despite the improvements we have witnessed so far, providing timely and state-of-the-art care for this vast population of patients continues to pose a daunting challenge. In a recent study, 66% of hospitals did not have stroke protocols and 82% had no system in place for rapid identification of patients with acute strokes. In addition, although it is approved by the FDA for the treatment of acute strokes within three hours of symptoms onset, intravenous tissue-type plasminogen activator, or tPA, is only being used in 2-3% of cases.

In 2000, the Brain Attack Coalition (BAC) initiated the concept of stroke centers and proposed two distinct types: primary and comprehensive. These initial recommendations were meant to mirror the designated trauma centers that were highly effective in improving patient outcomes in both

by Chirag D. Gandhi, MD and Charles J. Prestigiacomo, MD, FACS  
rural and urban areas.

The Brain Attack Coalition introduced a two-tier stroke center designation: First, a primary stroke center (PSC) capable of stabilizing and providing emergency care for patients with acute strokes. Once stabilized, these patients would then be transferred to a comprehensive stroke center (CSC) if they required more complex care. Alternatively, they could be admitted to the primary center for further care. In general, comprehensive centers would include tertiary hospitals and those hospitals that could perform more involved diagnostic testing and therapeutic interventions. Non-stroke center hospitals would send patients to primary stroke centers or directly to comprehensive stroke centers depending on regional referral patterns and infrastructure.

## The Primary Stroke Center

Since primary stroke centers could be more readily established and provide the greatest good for the greatest number, these recommendations were established first. The BAC outlined major components of a PSC including acute stroke teams, written care protocols, EMS, emergency departments, stroke units, and neurosurgical services. Support services such as a stroke center director, neuroimaging services, lab services, outcome and quality improvement, and continuing medical education were also required.

Depending on the facilities available at the hospital, the team is staffed by a

variety of healthcare providers. It is recommended, however, that it include members with an expertise in treating acute stroke and, at a minimum, should include a physician and another health care provider (nurse, PA, NP) who are *always* available to access patients within 15 minutes.

Well-written triage and treatment protocols for stroke patients should be in place in the hospital. Such protocols have been found to improve the quality of care and reduce the number of complications. Documentation should include the emergency care of patients with ischemic and hemorrhagic stroke, including stabilization, initial diagnostic testing, and the administration of medications, including tPA.

Since the release of the BAC guidelines, nationwide efforts are underway to credential hospitals as primary stroke centers. Accreditation as a PSC is carefully regulated and monitored by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO).

Currently, the state of New Jersey has 74 hospitals which can render acute care to stroke victims. *The chart on page 24 lists both the current primary and comprehensive stroke centers in the state at this time.* Many more are expected in the future.

## The Role of EMS and Emergency Department Triage

EMS plays a vital role in the assessment of patients in the field and the initiation of potentially life-saving

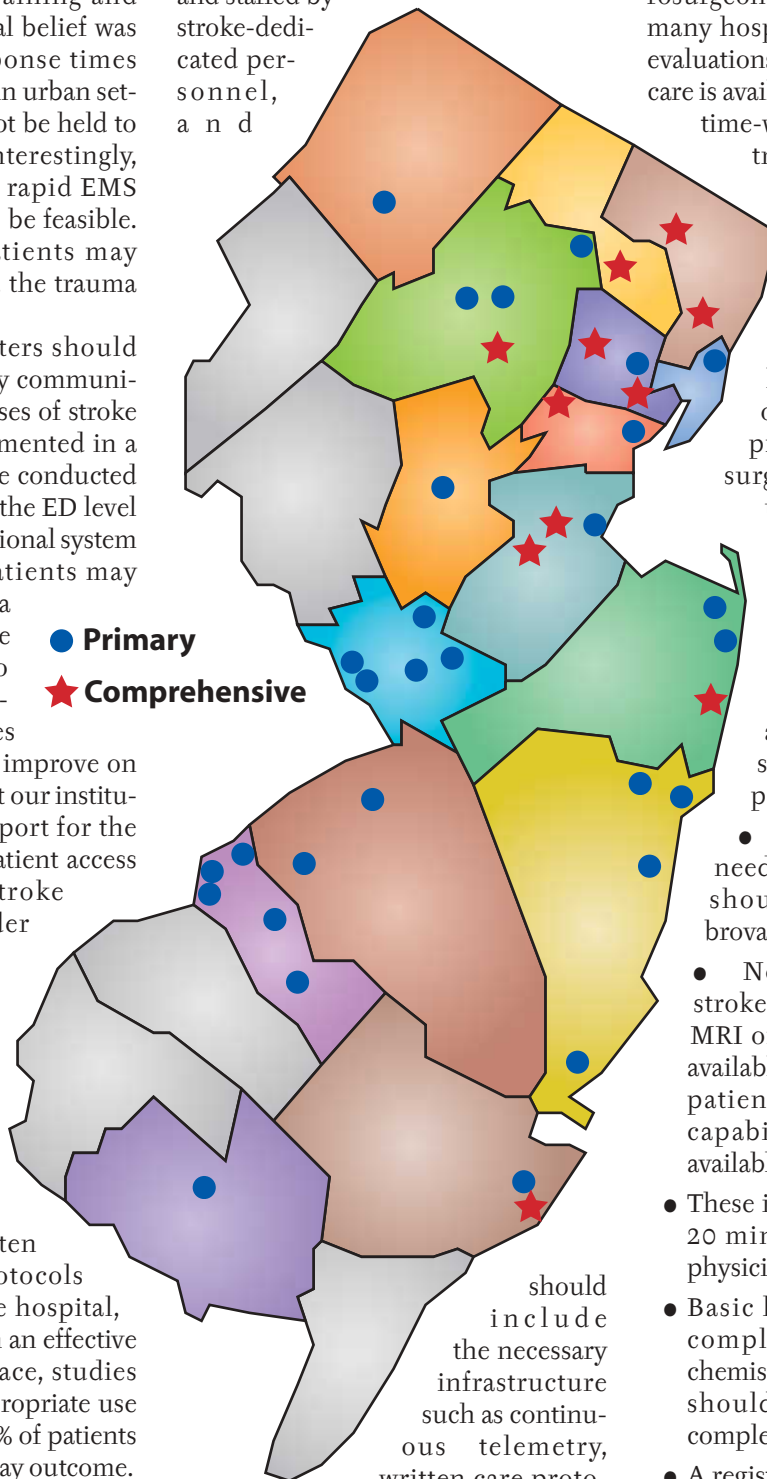
treatment. One of the challenges in improving this aspect of the BAC recommendations is that EMS is not nationally regulated, leading to substantial variability in training and response times. The initial belief was that although EMS response times could be improved easily in urban settings, rural locals could not be held to the same expectation. Interestingly, among trauma patients, rapid EMS access has been shown to be feasible. So, although stroke patients may present other challenges, the trauma data is encouraging.

In general, stroke centers should have systems to effectively communicate with EMS in acute cases of stroke and this should be documented in a written plan. Triage can be conducted at either the EMS level or the ED level depending on how the regional system is established. Some patients may require direct transfer to a comprehensive center. The stroke center should also be involved with consistent educational activities with EMS staff to further improve on care at least twice a year. At our institution, the role of air transport for the purposes of improving patient access to comprehensive stroke centers is currently under study.

Emergency departments serve as the first point of high-level stroke care and the personnel should be well-trained in the diagnosis and treatment of all types of stroke. As discussed earlier, well-written triage and treatment protocols should be in place at the hospital, beginning in the ED. With an effective treatment protocol in place, studies have shown that with appropriate use of tPA, an additional 11-13% of patients can have an excellent 90-day outcome.

Analysis of the effectiveness of stroke units demonstrates that acute stroke patients who received their care in dedicated stroke units versus general medical wards had a 17% reduction in death, a 7% increase in independent home living, and an 8%

reduction in length of stay. These are impressive statistics. These units do not need to be distinct wards but should be directed and staffed by stroke-dedicated personnel, and



● Primary  
★ Comprehensive

should include the necessary infrastructure such as continuous telemetry, written care protocols, and the ability to monitor blood pressure continuously. The creation of an actual stroke unit in a PSC is optional and is only needed if the center intends to provide care beyond the hyperacute period of ED evaluation and emergency therapy.

A number of stroke patients require neurosurgical evaluation for either an ischemic or hemorrhagic stroke. Because of the limited number of neurosurgeons, especially in rural areas, many hospitals cannot provide such evaluations. For a PSC, however, such care is available within two hours. This time-window may require either

transfer to another institution, or provide for an on-call neurosurgeon.

In hospitals that do provide neurosurgical care, an operating room should be available 24 hours in the event of an operative emergency. Again, protocols outlining neurosurgical coverage, call schedules, and transfer policies should be established and easily accessible.

As discussed earlier, the BAC requires specific patient care elements. Details of these elements are outside the scope of this summary but some key points are important.

- The stroke director need not be a neurologist, but should be an expert in cerebrovascular disease.
- Neuroimaging for acute stroke consists of either a CT or MRI of the brain and should be available within 25 minutes of the patient's arrival in the ED. The capability for imaging must be available 24/7.
- These images must be read within 20 minutes by an experienced physician.
- Basic lab services that include complete blood count, blood chemistry, and coagulation studies, should always be available and completed within 45 minutes.
- A registry should be established to track diagnosis, treatment, and outcomes in order to improve the quality of care. A committee should review these benchmarks three times a year.
- Finally, since the field is evolving

so rapidly and since so many departments and services are involved, joint educational programs, related to cerebrovascular disease and care, are essential.

### Comprehensive Stroke Center

The BAC's proposal also consisted of comprehensive stroke centers that were defined as facilities with the personnel, infrastructure, and expertise to diagnose and treat stroke patients who require a high intensity of medical or surgical care, specialized diagnostic tests or interventional therapies. The key components of a CSC comprise four areas: personnel with specific areas of expertise; specialized diagnostic and treatment techniques; facility infrastructure; and other programmatic areas.

These criteria are currently being implemented in several states. The "Stroke Center Act" (N.J.S.A. 26:2H-

12.27 to 12.32) was adopted in New Jersey in September, 2004. This act required the NJ Department of Health & Senior Services to establish the two-tiered system of stroke centers in order to adequately address the public health need. New Jersey and Florida represent the first states to provide state-recognized comprehensive stroke centers, as approved by each state's respective department of health.

In addition to the patient care responsibilities, CSCs serve as the referral center for surrounding PSCs, thus establishing a regional net to provide state-of-the-art care to stroke patients throughout the state. As such, CSCs also serve as a center for education and training to staff and physicians of affiliated PSCs.

### Long-Term Studies Promise EMS Integration

Preliminary analyses demonstrate a

benefit in the implementation of primary stroke centers across the United States. Of course, long-term studies of both primary and comprehensive stroke centers are required and are already underway in many institutions. If proven effective, as is strongly suspected, EMS assessment and transport of these patients will be integrated with these centers to further improve a patient's chance at achieving full recovery.

**Charles J. Prestigiacomo, MD, FACS**, is Associate Professor and **Chirag D. Gandhi, MD**, is Assistant Professor in the Department of Neurological Surgery and Radiology at the New Jersey Medical School, University Hospital, University of Medicine and Dentistry of New Jersey. Both physicians specialize in the surgical and endovascular treatment of cerebrovascular diseases of the brain and spine.



# New Jersey Stroke Centers

## PRIMARY

- ATLANTIC** AtlanticCare Regional Medical Center - Pomona
- BURLINGTON** Virtua Memorial Hospital - Mount Holly  
Virtua West Jersey Hospital - Marlton

- CAMDEN** Virtua West Jersey Hospital - Voorhees  
Virtua West Jersey Hospital - Berlin  
Cooper University Hospital - Camden  
Kennedy Memorial Hospital - Cherry Hill  
Our Lady of Lourdes Medical Center - Camden

- CUMBERLAND** South Jersey Regional Medical Center - Vineland
- ESSEX** Clara Maas Medical Center - Belleville
- HUDSON** Palisades Medical Center - North Bergen

- MERCER** Capital Health System - Mercer  
Capital Health System - Fuld  
University Medical Center - Princeton  
St. Francis Medical Center - Trenton  
Robert Wood Johnson University Hospital - Hamilton

- MIDDLESEX** Raritan Bay Medical Center - Perth Amboy
- MONMOUTH** Monmouth Medical Center - Monmouth  
Riverview Medical Center - Red Bank

- MORRIS** Chilton Memorial Hospital - Pompton Plains  
St. Clare's Hospital - Denville  
St. Clare's Hospital - Dover

- OCEAN** Southern Ocean County Hospital - Manahawkin  
Community Medical Center - Toms River  
Kimball Medical Center - Lakewood  
Ocean Medical Center - Brick

- SOMERSET** Somerset Medical Center - Somerville
- SUSSEX** Newton Memorial Hospital - Newton
- UNION** Trinitas Hospital - Elizabeth

## COMPREHENSIVE

- ATLANTIC** AtlanticCare Regional Medical Center - Atlantic City

- BERGEN** Valley Hospital - Ridgewood  
Hackensack University Medical Center - Hackensack
- ESSEX** University Hospital - UMDNJ - Newark  
St. Barnabas Medical Center - Livingston

- MIDDLESEX** Robert Wood Johnson University Hospital - New Brunswick  
JFK Medical Center - Edison
- MONMOUTH** Jersey Shore Medical Center - Neptune

- MORRIS** Morristown Memorial Hospital - Morristown
- PASSAIC** St. Joseph's Regional Medical Center - Wayne
- UNION** Overlook Hospital - Summit