

# Key Elements of a Successful Stroke Team

Organization of an effective stroke team will require strong administrative support and broad multispecialty input.

BY CARL M. BLACK, MD; JEANIE HAMMER, BS; AND JOSEPH WATKINS, MD

**M**ore than 750,000 strokes occur in the US each year. Successful stroke awareness campaigns by the American Stroke Association and other groups have increased public awareness and raised expectations for acute care.<sup>1,2</sup> Nowhere in medicine is teamwork more vital to the success of a program than in acute stroke management.

In an effort to improve stroke care and move toward best-practice medicine, the Brain Attack Coalition and the American Stroke Association have provided multidisciplinary consensus statements for the establishment of primary and comprehensive stroke centers.<sup>1,2</sup> Primary stroke centers have the capability to treat most patients with acute ischemic stroke, and comprehensive stroke centers are better suited to diagnose and manage cerebrovascular accidents due to more complex etiologies, such as aneurysms or vascular malformations.

Primary certification is available through the Joint Commission on Accreditation of Health Organizations (JCAHO).<sup>3</sup> The essential elements of a primary stroke center include executive-level administrative support; a formally defined and organized stroke team; written care protocols for diagnosis and treatment; coordination with local emergency medical services; close collaboration with the emergency department; availability of a stroke unit; neurosurgical support (within 2 hours), neuroimaging capability, and laboratory services available 24 hours per day, 7 days per week; a quality assurance program with methods for tracking outcomes; and ongoing educational activities.

Organizing and integrating the whole package is a formidable challenge. Although some elements of an effective

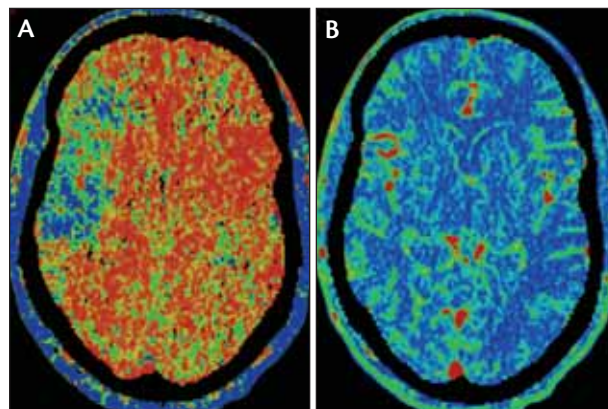


Figure 1. Imaging of a 36-year-old man within 2 hours of acute-onset left hemiparesis. Computed tomography (CT) perfusion imaging reveals a reduced mean transit time (A), while blood volume is within normal limits (B). The mismatch is indicative of a significant penumbra in the distribution of the right middle cerebral artery.

stroke team may vary slightly from one institution to another, strong administrative support, leadership, and broad physician buy-in by local specialists are critical. A newly formed stroke team should expect ups and downs in the process. The program will require considerable time, diplomacy, and patience to establish and maintain.

## ADMINISTRATIVE SUPPORT

JCAHO certification requires the full, executive support of hospital administration. In addition to providing an unwavering endorsement for stroke care, the hospital must budget for capital requirements to fund equipment, expanded

facilities, and critical personnel, such as a full-time stroke coordinator. Full-time call coverage may become an issue, especially for specialties in short supply. Recruitment and supplemental pay for call coverage may need to be considered. The long-term success of a stroke program requires strong, top-down support.

### PHYSICIAN LEADERSHIP

The program will stagnate without broad, multispecialty support and involvement from emergency medicine, neurology, interventional radiology/neuroradiology, neurosurgery, pulmonology, hospitalists, internal medicine, family practice, cardiology, and rehabilitation. The precise composition of the team will vary depending on available expertise.

A physician with expertise in cerebrovascular disease may serve as the stroke team medical director. Ideally, a neurologist would be either the medical director or codirector, depending on availability and interest. It is the role of the director to facilitate communication among specialists, build consensus, and oversee the global stroke team agenda. Monthly team meetings provide a forum to review outcomes and interesting cases, and to track progress on quality improvement initiatives. The director works closely with the stroke coordinator to set the agenda and make assignments for group education and outcomes review.

### STROKE TEAM COORDINATOR

The stroke team coordinator is critical to the mission. The coordinator's duties include education, daily program oversight, monitoring of outcomes, and quality assurance initiatives. It is likely that the coordinator will offer the greatest continuity for the stroke program.

JCAHO has established several performance measures to form the basis of a quality assurance program. The coordinator should track these measures along with other basic measures of outcomes assessment (Table 1).<sup>3</sup>

The stroke coordinator also serves as an educator for regional medical personnel and the lay public. There should be ongoing educational activities for the community, emergency medical service providers, physicians, emergency department staff, and hospital staff. Patient and family support and education are also an important focus of the coordinator. The coordinator may often be one of the primary sources of emotional support and education for families and patients during their hospitalization.

### OTHER KEY ELEMENTS

#### Consistency

The ability to provide full and consistent 24/7 coverage is fundamental to the success of a stroke program. Inconsistency will only lead to frustration and possible failure of the program. Much of the infrastructure and staffing

requirements, such as intensive care, may already be in place at a larger tertiary facility. However, in some instances, constant call coverage by key specialists may present a challenge. Acute stroke care can be disruptive to a physician's practice and, depending on the number of colleagues in the call pool, can place team members at risk for burnout and attrition. This is an area where hospital administration may assist through the recruitment of hospital-based specialists, such as internists and stroke neurologists.

#### Imaging

Neuroimaging capability and interpretation must be available at all times. An immediate noncontrast CT is the standard of care. Perfusion imaging, whether with CT or MRI, is playing an increasingly important role in the work-up and triage of acute stroke victims. Many institutions now employ an acute imaging algorithm, which consists of a noncontrast head CT, immediately followed by CT perfusion and CT angiography. With new, high-speed multidetector scanners, the entire imaging sequence can be accomplished within minutes after arrival to the emergency room.

CT perfusion imaging has been shown to delineate irreversible infarct from surrounding ischemic brain at risk. The reversible region is defined as the penumbra.<sup>4</sup> The presence or absence of penumbra could potentially improve triage because one may opt for a more- or a less-aggressive treatment regimen, depending on the imaging findings (Figure 1).

Cardiac imaging is likewise vital in the work-up of acute stroke. Echocardiography should be readily available for the work-up of possible underlying stroke risk

**TABLE 1. STANDARDIZED PERFORMANCE MEASURES FOR STROKE**

| Measure     | Disease-Specific Core Performance Measure                           |
|-------------|---|
| Stroke – 1* | Deep vein thrombosis prophylaxis                                    |
| Stroke – 2* | Discharged on antithrombotics                                       |
| Stroke – 3* | Patients with atrial fibrillation receiving anticoagulation therapy |
| Stroke – 4* | Tissue plasminogen activator (tPA) considered                       |
| Stroke – 5  | Antithrombotic medication within 48 hours of hospitalization        |
| Stroke – 6  | Lipid profile   |
| Stroke – 7  | Screen for dysphagia  |
| Stroke – 8  | Stroke education  |
| Stroke – 9  | Smoking cessation   |
| Stroke – 10 | A plan for rehabilitation was considered                            |

*Note: Performance measures as recommended by the Joint Commission on Accreditation of Stroke Centers.*

\*Required elements.

factors, such as left atrial thrombus (atrial fibrillation) and patent foramen ovale.

### Interventional/Endovascular Expertise

tPA is FDA approved for use in acute strokes treated within 3 hours of onset. However, intra-arterial therapies may have increased effectiveness compared to intravenous therapy in the treatment of larger, proximal arterial thrombi near the skull base.<sup>2,5,6</sup> Intra-arterial therapy may also extend the therapeutic window in the anterior circulation to 8 hours, depending on the technique. The FDA recently approved a mechanical thrombus extraction device that has demonstrated effectiveness in recanalization of proximal large arterial embolic occlusions.<sup>6</sup> A program with intravenous- and intra-arterial-based options provides significantly greater opportunity for successful treatment (Figure 2).

### Written Care Protocols

Written protocols help standardize and improve patient flow and treatment. Consistency improves outcomes and reduces chance for error. Stroke protocols should be reviewed and updated regularly by the multidisciplinary team. There may never be a “final version,” because protocols should be adapted regularly to accommodate new research, local needs, and resources. Protocols should specifically address the continuum of care from diagnosis and treatment through follow-up and rehabilitation and should include guidelines for management of either ischemic or hemorrhagic stroke.

### Stroke Care Unit

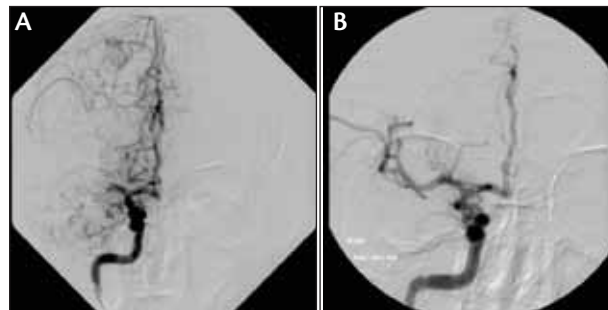
The stroke care unit need not occupy a space separate from the existing medical or surgical intensive care units (ICU). The concept of ICU stroke care requires the intensivists to receive supplemental training and support in stroke-specific issues. JCAHO recommends at least 8 hours of stroke-specific continuing medical education annually for ICU staff involved in stroke care.<sup>3</sup>

### Rehabilitation

The physical medicine and rehabilitation team helps to optimize and accelerate patient recovery. The referral should be seamless under most circumstances, but the stroke coordinator may need to ensure that appropriate consults are scheduled and that long-term follow-up has been arranged.

### CONCLUSION

Although stroke remains one of the leading causes of death and disability worldwide, there has been significant recent progress with the introduction of promising diagnostic and treatment technologies. New paradigms for delivery of quality stroke care offer patients and their families



**Figure 2.** A baseline right internal carotid cerebral angiogram of the patient from Figure 1 demonstrates a right M1 occlusion (A). Follow-up angiography after intra-arterial intervention (tPA, Merci retriever [Concentric Medical, Inc., Mountain View, CA] and balloon angioplasty) shows near-complete recanalization of the right middle cerebral artery (B). The patient was discharged to home 2 days later with no residual deficit. Case courtesy of Dennis Heaston, MD.

increased hope. However, optimal care cannot occur in isolation. The concept of a stroke team, strongly supported by community and hospital resources, is necessary not only for JCAHO certification but also for optimization of patient care and to establish a model of best-practice medicine. ■

*Carl M. Black, MD, is the Stroke Team Codirector, Utah Valley Regional Medical Center in Provo, Utah. He has disclosed that he holds no financial interest in any product or manufacturer mentioned herein. Dr. Black may be reached at (801) 357-8776; carl.black@comcast.net.*

*Jeanie Hammer, BS, is the Stroke Team Coordinator, Utah Valley Regional Medical Center in Provo, Utah. She has disclosed that she holds no financial interest in any product or manufacturer mentioned herein. Ms. Hammer may be reached at (801) 357-8879; jeanie.hammer@intermountain-mail.org.*

*Joseph Watkins, MD, is the Stroke Team Codirector, Utah Valley Regional Medical Center in Provo, Utah. He has disclosed that he holds no financial interest in any product or manufacturer mentioned herein. Dr. Watkins may be reached at (801) 357-7850; jwatkins@viasubscription.com.*

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