Building a Stroke Center

A systems approach to better outcomes.

BY MARILYN M. RYMER, MD

There is growing enthusiasm for building stroke centers, partly because of evolving new therapies. Building a center correctly can be a complicated process, and cannot be based solely on recruitment of a single stroke specialist. This article is based on the experience and success of the Saint Luke's Hospital Stroke Center in Kansas City, Missouri, founded in 1993.

An organized approach to stroke care should be the goal for every hospital so that it may provide the best possible outcome for every patient. The first issue to address when deciding to build a stroke center is to determine what can be realistically provided for each of the key aspects of care:

- Acute stroke intervention and management
- Prevention of complications
- Secondary stoke prevention
- Early rehabilitation

An organized, evidence-based approach to each of these aspects of stroke care contributes to the quality of the outcomes and requires an infrastructure that the organized stroke center can provide.

ACUTE STROKE TREATMENT

It is likely that acute stroke treatment will always be time-dependent, with the best outcomes resulting from the earliest interventions. Options for acute stroke treatment include those that do not require interventional access, such as intravenous thrombolysis or hypothermia and those that require an interventional team, such as intra-arterial thrombolysis or mechanical embolectomy.

In organizing a stroke center, it is very important to decide if acute therapy is going to be offered, whether it will be available 24/7, and whether it will include interventional therapies. Centers not offering full-time interventional stroke treatment may want to establish a transfer agreement with a center that does (Figure 1).

Those centers deciding to provide 24/7 interventional treatment are taking on the biggest challenge of all. Close communication with emergency medical service crews is essential. The emergency department (ED) personnel must be trained to triage and diagnose stroke accurately and quickly. Physicians and technicians trained in acute stroke treatment and intervention must be available 24/7 with a response time of 30 minutes. Neuroimaging, laboratory, and pharmacy services must be able to respond emergently. Flowcharts, standing order sets, and care paths are essential to guarantee that nothing is overlooked when everything is being done very quickly.

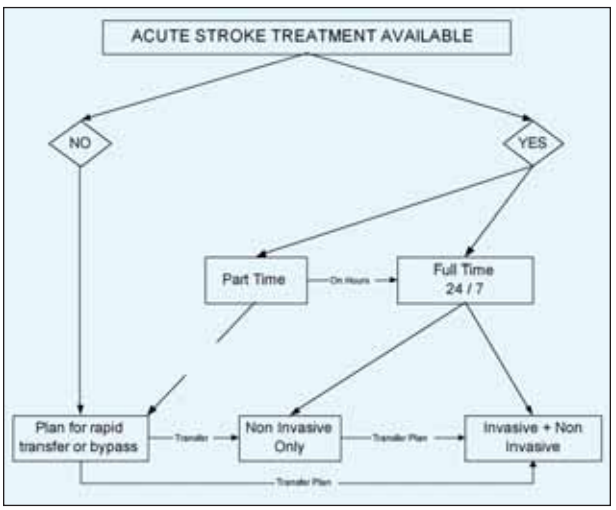

Figure 1. This algorithm for evaluating the availability of acute stroke treatment should be used to assess capabilities of each institution.

MEDICAL MANAGEMENT

There is conclusive evidence that stroke victims—even those ineligible for acute intervention—who are managed in an organized stroke center have better outcomes and decreased mortality rates.[1] Care paths, standing order sets, and highly trained nurses comprise the basic infrastructure that guarantees standardized, evidence-based care in five areas:

- Tight control of physiologic parameters, such as blood pressure and glucose

- Prevention of complications, such as deep vein thrombosis, aspiration pneumonia, urinary tract infections, and falls
- Diagnosis of the cause of the stroke
- Plan for secondary prevention
- Early rehabilitation

REHABILITATION

It is clear that early access to rehabilitation specialists improves outcomes and decreases the length of stay on the acute hospital unit. The goal is to have physical, occupational, and speech therapists perform evaluations on the first day and initiate plans for the next phase of rehabilitation, if needed. With the growing body of information about neuroplasticity and the potential for neurologic recovery months or years after injury, the entire field of neurorehabilitation is entering a new era.

The analysis of what can be realistically provided for each of these aspects of care defines the work of the developing stroke center. Ideally, hospitals delivering primary care will establish relationships with tertiary care institutions to carry out the more sophisticated and resource-intense interventions and evaluations. The Brain Attack Coalition published recommendations for the components of a primary stroke center[2] and of a comprehensive stroke center,[3] which provide guidelines for institutions wanting to make these assessments.

STROKE CENTER ORGANIZATION

For a stroke center to be successful, it must have strong leadership and be backed by organizational will. The strongest stroke centers are led by an administrator committed to the success of the program and a physician and nurse champion. Taking excellent care of patients with strokes requires cooperation from multiple hospital departments and dedicated clinicians. An effective partner in administration is important to the success of the clinicians.

It is also important to develop a written vision, mission, and strategic/business plan for the stroke center early in the process of organization and to gain support for that vision and plan from the highest levels of responsibility in the organization, the board of trustees, and senior hospital administration. These written documents will vary in complexity according to program size, but even a basic plan serves as a guide for the stroke center's work. Yearly review of the documents provides an opportunity to evaluate progress and set goals for the future. A board member or committee of the board that serves as a liaison among the stroke center leaders, the board of the hospital, and the community can be integral to the program's successful launch and maintenance. The complex work of the stroke center can be organized around several key teams of people.

TABLE 1. LIAISON TEAM MEMBERS

- Nurses in the units where stroke patients receive care
- Nurses and therapists in the rehabilitation unit
- Marketing: As the program grows, there will be opportunity and need for internal and external marketing. Sharing stories about positive outcomes is a powerful marketing and educational tool.
- Foundation representative: If the hospital has a charitable foundation, that organization can be a source of funding for research and education projects.

THE CORE LEADERSHIP TEAM

Designating a medical director, nurse coordinator, and administrator for the stroke program sets up lines of responsibility for program development and clinical quality. In the most basic programs, these responsibilities may be as simple as developing the policy and mechanism for transfer of acute stroke patients to a center capable of acute intervention and standards of care for those patients ineligible for transfer. The medical director is a physician with interest and expertise in the care of stroke patients, often a neurologist. In larger programs, this position is financially compensated by the hospital based on the time commitment. The medical director's role is to provide leadership in strategic planning, clinical quality, protocol development, education of and communication to various constituencies, research, and fundraising.

The nurse stroke team coordinator's role is essential regardless of the size or complexity of the stroke program. In some programs, this may be an advanced practice nurse who can do independent patient assessment and billing, although in most settings, the nurse coordinator is a hospital employee with expertise in neuroscience. Depending on the program's size, the role of stroke team coordinator may be combined with other related responsibilities. The nurse coordinator works closely with the medical director and shares responsibility for stroke center planning, clinical quality, updated protocols, and clinical operations. The nurse coordinator takes primary responsibility to educate all stroke team nurses and technicians, including National Institute of Health Stroke Scale (NIHSS) training.

In larger programs, the administrator for the stroke center may be a full-time position. However, in many hospitals, this assignment may be combined with other related responsibilities. The administrator strategically plans with the stroke team clinicians to anticipate equipment, space, and personnel needs and represents the stroke center at administrative and budget meetings. The administrator may also supervise hospital employees who work with the stroke team.

The core leadership team bridges the activities of the clinical stroke team and the rest of the stroke program operations (Figure 2).

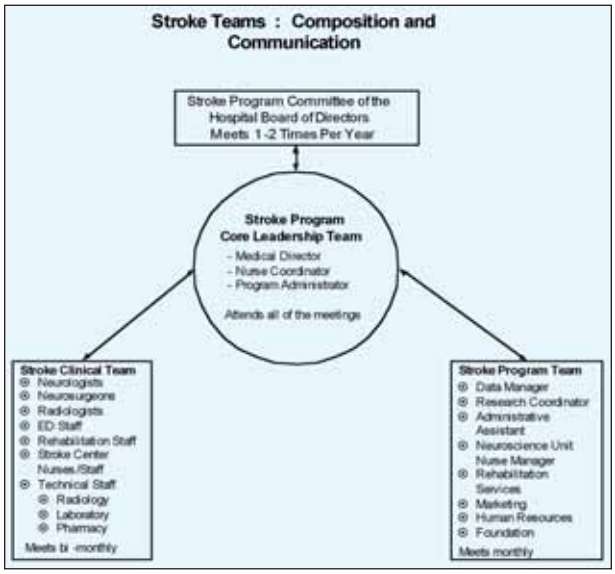

Figure 2. Composition and relationships of the key stroke center teams.

THE CLINICAL TEAM

The composition of the clinical team will vary depending on the level of service provided. If all phases of clinical services for stroke are offered, then it is ideal to have neurologists, neurosurgeons, neurointerventionists, ED staff, rehabilitation physicians, nurses and therapists, stroke center nurses, and technical support staff in radiology, lab, and pharmacy represented on the team. Some members of this team will need to be available 24/7. Programs may choose to use hospitalists, intensivists, emergency medicine, or primary care physicians in the role of the stroke neurologist. The ED, radiology, laboratory, and pharmacy may find it beneficial to designate one person to be the principal communication link to the stroke team.

The responsibilities of the clinical team are to take excellent care of the patient to ensure the best possible outcome and to communicate with the family and referring physicians. The members of the team will change depending on the patient's location and the care that is provided.

The expertise of the nurses involved in the care of stroke patients is one of the critical success factors for an outstanding stroke center. Nurses in the ED, ICU, and acute stroke center should have organized stroke education and certification to use the NIHSS.

THE STROKE PROGRAM TEAM

Additional team members can enrich and support the the stroke program's activities. Some of these people work primarily to support the stroke program and others function as liaisons (Table 1) to connect the stroke team with other resources and departments of the hospital.

The Data Manager

Tracking clinical and financial data is critically important when operating an efficient and high-quality stroke program. Administrative data may be used for an overview of mortality, disposition, complications, and costs. Using a stroke-specific database gives much more detailed information and is useful for clinical analyses, trending, benchmarking, and research. Several commercial stroke databases are available or one can be developed that is unique to the institution. The nurse coordinator may be able to manage the data, but many larger programs have a dedicated position for this work.

The Research Coordinator

The opportunities for stroke centers to participate in clinical research continue to grow. Clinical trials can be successfully run in community hospitals as well as academic centers and are often a source of excitement and pride for the team. The research coordinator is generally a nurse experienced in the care of stroke patients. A good clinical nurse can be trained to understand the regulatory requirements and other aspects of directing a research trial. Formal courses are available for in-depth training, and some coordinators may choose to become officially certified. In some programs, the nurse coordinator for the stroke team may also be the research coordinator. If the clinical trial involves acute stroke management or intervention, then the question of 24/7 coverage must be addressed.

The Administrative Assistant

It is essential to budget for a position to support the activities of the stroke team.

In larger programs, many people from multiple departments are involved in the operations of the stroke center, and most of these people are managed through their own departments. However, there are some positions in the program that logically report to the stroke program administrator (Figure 3).

MEETINGS

The Planning Phase

In the planning phase of the stroke center, the medical director, nurse coordinator, and administrator (core team) can serve as the basic planning committee. Once the scope of the program is determined, the planning team will need to communicate with representatives from the departments involved in the care of the stroke patients. Balancing getting input from key clinicians and technicians with minimal disruption of their clinical activities is the challenge. One way to approach this is to have the planning team concentrate on one department at a time. For example, when the planning involves ED operations, the core team can meet with the

representatives from the ED to discuss the pertinent issues. This same process can occur with key physicians and personnel in neurology, neurosurgery and radiology, pharmacy, lab, radiology, rehabilitation services, marketing, etc.

When there are overlapping issues (eg, stocking tPA in the ED), then representatives from pharmacy and ED can both meet with the core planning team. This process will save the time of the people in the various departments. Only the core team will participate in all of the meetings. It is very important to circle back and make sure that the results of the planning are communicated back to the entire department (eg, ED) for comments and suggestions. The core leadership team functions as the communication hub, getting input from all the departments and clinicians and communicating back to the department that provided the input for final review.

Clinical Operations

Meetings to discuss clinical operations are already established in most hospitals. The neuroscience department meetings and the morbidity and mortality conferences, for example, can serve as a forum for discussion of stroke center clinical issues, difficult or interesting cases, and review of data regarding complications, outcomes, and volumes. Members of the clinical team, the core leadership team, as well as the data manager will be attending these meetings. High-volume acute stroke intervention centers find it useful to review all of the interventional cases on a weekly basis.

Managing Operations

After the program is up and running, it is useful to have a monthly meeting of key members involved in the stroke program to discuss operations. The core leadership team (the medical director, nurse coordinator, and administrator) plus the data manager, research coordinator(s), and representatives from the nursing staff of the stroke center, marketing, the hospital foundation, and rehabilitation department might attend the stroke program operations meeting. Discussions regarding clinical, research and educational activities and reports from the data manager, marketing, and foundation representative could be regular agenda items. This group could be responsible for setting yearly goals for the stroke program and evaluating whether they are achieved. Stroke program clinicians could look to this operations group to solve problems they identify.

Board Meetings

If the stroke program has a committee on the board of the hospital attached to it, then meeting with that committee once or twice a year to report activities is very important.

THE STROKE CENTER

The complete spectrum of care for the stroke patient will occur in multiple locations in the medical center, such as the ED, operating room, interventional radiology suite, intensive care unit, stepdown unit, medical/surgical hospital unit (stroke center), rehabilitation unit, and outpatient offices. The excellent outcome for stroke patients in dedicated units does not depend on the physical space but on the expertise of the staff and the standardized protocols for care. Nurses in all of the units need stroke education and, ideally, NIHSS certification.

Once the patient is ready to be cared for at a medical/surgical unit, it is worthwhile to have a specified place to send stroke patients. This can be accomplished by simply designating some beds on a given unit as the stroke center beds. Even in large-volume centers, eight to 10 beds are generally enough. Nursing expertise can be achieved by training a core number of stroke center nurses, and protocols and standing orders can be used routinely. The patient-to-nurse ratio on this unit should be no more than 4 or 5:1. If stroke patients are scattered throughout the general units of the hospital, it is almost impossible to achieve the nursing expertise and routine use of standardized tools. Stroke center beds should always have cardiac monitoring available, as unsuspected arrhythmias are common in stroke victims.

The work on this unit is to prevent complications such as aspiration, urinary tract infection, and deep vein thrombosis, to perform diagnostic studies to try to determine the cause of the stroke, address secondary prevention issues, and institute early rehabilitation. By concentrating the patients in one location, the nurses become familiar with neurological assessment and the diagnostic workup for stroke. This knowledge is very useful in communicating with families and referring physicians and can potentially decrease the length of stay.

It is important to have a sign identifying this part of the unit as The Stroke Center. A poster-sized version of the stroke clinical path can be hung on the wall. The staff as well as the patients and their families know that something unique for the care of stroke is going on. In this era of shortages of hospital beds, it must be clear that if the stroke center beds are not occupied by stroke patients, then other patients can be placed there. However, stroke patients take priority.

A stepdown unit where staffing ratios would be 3:1 (patients to nurse) is a very useful concept for the care of stroke victims. Patients who have had acute stroke intervention, carotid stenting, or uncomplicated clipping of an aneurysm may not need ICU-level care but require closer observation than in the stroke center where nurses are caring for five or more patients. The care in the stepdown unit could include frequent neurologic assessment, careful blood

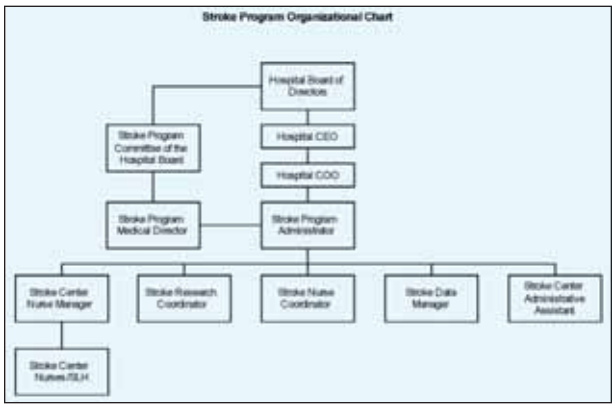

Figure 3. Organization chart for the personnel of a comprehensive stroke center.

pressure monitoring, and management to include IV drip therapy for blood pressure and glucose control.

THE TOOLS OF THE TRADE

The purpose of all of the tools is to standardize evidence-based care as much as possible for acute interventional therapies, prevention of complications, institution of early rehabilitation, performance of appropriate diagnostic studies, identification of issues in secondary prevention, assurance that appropriate treatment is given, and effective communication with patients, families, and referring physicians.

Stroke clinical care paths can be organized in days or phases. Ideally, the path is initiated in the ED and carries through the ICU, stroke center, and interfaces with the stroke rehabilitation care path. Usually, the path is a tool used by nurses rather than physicians and can be used as a nursing charting tool to avoid double documentation. The path can also be the source for documenting specific data elements required by insurers or the Joint Commission on the Accreditation of Hospitals Organization (JCAHO), such as verification that stroke education and information on smoking cessation were provided to the patient.

Paths for ischemic and hemorrhagic stroke may be different from paths for subarachnoid hemorrhage and transient ischemic attack. Many centers develop patient paths that track the same information in lay terminology for patients and families. The stroke team nurse coordinator should review the paths annually to be sure that they are based on current evidence.

The correlating tools for physicians are the standing order sets. Ideally, each path has an associated order set. The first order on stroke standing orders should be, "Initiate stroke care path." This automatically activates the measures to prevent complications and initiate early rehabilitation. Physicians sometimes resist using standing order sets. However, no diagnostic test is done or medication given without specific orders from the attending physician. Once familiar with use of the order set, physicians find it saves time. It is very important when developing these orders to write a draft version and ask the physicians who will be admitting patients with strokes to make suggestions and changes. The physicians should also be given the opportunity to review the yearly updates to the order sets.

One technique to encourage physicians to use order sets is to require any patient who is admitted to a stroke center bed to be on the care path. The medical director and nurse coordinator can facilitate communication between the attending physicians and the stroke center staff about these issues.

In addition to establishing order sets that address various types of strokes and transient ischemic attacks, it is helpful to have standing orders for blood pressure management, deep vein thrombosis prophylaxis, pre- and postinterventional procedures, such as stenting, clipping, and thrombolysis, and pre- and postsurgical procedures.

Whenever the process of care is complex, developing a protocol or flowchart can help ensure that everything is done properly and that all the providers of care are communicating accurate information. Several models for these kinds of tools are available in *The Stroke Center Handbook*.[4]

An effective ED flowchart for stroke treatment puts all the pertinent information onto one page for clear communication. As acute stroke is a dynamic situation, tracking the neurological status of the patient over time is critical. Most stroke centers perform an NIHSS on admission, at 24 hours, and at discharge. However, more frequent evaluation of the neurological status of the patient is often critical and a neurological frequent assessment tool based on a modified NIHSS should be developed.[4]

CONCLUSIONS

There are numerous models for building a successful stroke center. Most have common recommendations for essential personnel and resources. The convergence of increasing incidence of stroke based on changing population demographics and emerging new therapies for acute intervention, prevention, and rehabilitation presents an enormous opportunity to "build it and they will come." ■

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