

North Carolina Stroke Prevention and Treatment Facilities Survey

rtPA Therapy for Acute Stroke

Larry B. Goldstein, MD; Lloyd A. Hey, MD; Ronnie Laney, BS

Background and Purpose—North Carolina is situated in the “stroke belt” region of the United States, an area of the country with a particularly high incidence of cerebrovascular disease. The North Carolina Stroke Prevention and Treatment Facilities Survey was carried out to determine the availabilities of a variety of stroke prevention and treatment services throughout the state. The purpose of the present study was to determine how widely recombinant tissue-type plasminogen activator (rtPA) has been adopted for the treatment of patients with acute ischemic stroke and to determine the characteristics of the medical facilities in the state offering this therapy.

Methods—A single-page survey was mailed to the medical center directors of each inpatient medical facility in North Carolina. Data collected included questions related to the availability of selected basic and advanced diagnostic tests and procedures, stroke prevention and treatment programs and services (community stroke awareness program, acute stroke identification program, acute stroke team, stroke rtPA protocol, stroke care map, neurologist), and facilities (Stroke Acute Care Unit or equivalent).

Results—Responses were obtained from all 125 inpatient medical facilities in North Carolina. rtPA stroke protocols were adopted in 54 facilities located in 46 of the state’s 100 counties. Seventy-four percent of the state’s population resides in counties with hospitals providing rtPA treatment. Compared with facilities not offering rtPA, those with rtPA protocols more commonly sponsored stroke community awareness programs (41% versus 17%, $P=0.003$) and more frequently had an organized stroke team (31% versus 8%, $P=0.001$), used stroke care maps (56% versus 17%, $P<0.001$), had rapid stroke identification programs (33% versus 6%, $P<0.001$), or had a Stroke Acute Care Unit or its equivalent (33% versus 7%, $P<0.001$). Neurologists were available in 78% of the facilities offering rtPA compared with 38% in facilities without rtPA protocols ($P<0.001$).

Conclusions—These data show that this new therapy for ischemic stroke is potentially available to a high proportion of the state’s citizens based on their county of residence. However, other services that may improve outcomes and reduce stroke-related costs (eg, stroke teams, stroke units, care maps) are not being widely used, even in centers providing treatment with rtPA. The simple methodology used in this study is potentially applicable in other states and permits targeting of selected centers for development of stroke treatment capabilities. (*Stroke*. 1998;29:2069-2072.)

Key Words: cerebrovascular disorders ■ data collection ■ emergency medical services ■ plasminogen activator, tissue type ■ thrombolytic therapy

The prevention and treatment of stroke is undergoing a revolution. Much of this excitement has been prompted by the advent of recombinant tissue-type plasminogen activator (rtPA) therapy for selected patients with acute ischemic stroke.¹ Although there has been some controversy surrounding the use of rtPA,²⁻⁵ emerging data⁶⁻⁹ suggest that judicious use of this drug in a variety of community settings results in outcomes similar to that found in the clinical trial that led to the approval of rtPA by the Food and Drug Administration. In addition to rtPA, other hyperacute therapies are currently under development. A variety of healthcare organizations are

stressing the need for public education concerning stroke symptoms and for the development of medical systems capable of rapidly identifying, triaging, and treating patients with acute stroke.

North Carolina lies in the country’s “stroke belt,” and cerebrovascular disease is a major public health problem in the state.¹⁰ The purpose of the present study was to determine how widely rtPA has been adopted for the treatment of patients with acute ischemic stroke by North Carolina hospitals and the characteristics of the medical facilities offering this therapy.

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From the Departments of Medicine (Neurology) (L.B.G.) and Surgery (L.A.H., R.L.), Duke Center for Cerebrovascular Disease (L.B.G.), Center for Clinical Health Policy Research (L.B.G.), Center for Clinical Effectiveness (L.A.H., R.L.), Duke University, Durham, NC, and the Durham VA Medical Center (L.B.G.), Durham, NC.

Correspondence to Larry B. Goldstein, MD, Director, Duke Center for Cerebrovascular Disease, and Head, Stroke Policy Program, Center for Clinical Health Policy Research, Box 3651, Duke University Medical Center, Durham, NC 27710. E-mail golds004@mc.duke.edu

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TABLE 1. North Carolina Stroke Prevention and Treatment Facilities Survey

Please mark below to indicate the availability of the indicated programs or procedures at your facility:

Diagnostic Tests and Procedures

- ☐ Carotid duplex ultrasonography
☐ Transcranial Doppler ultrasonography
☐ Cerebral angiography
☐ Brain CT scan
☐ Brain MRI scan
☐ Diffusion-weighted MRI
☐ Magnetic resonance angiography
☐ CT angiography
☐ Transthoracic echocardiography
☐ Transesophageal echocardiography

Programs and Services

- ☐ Community stroke awareness program
☐ Carotid endarterectomy
☐ Emergency department
☐ Acute stroke team
☐ Stroke care map
☐ Acute stroke identification program
☐ Stroke rtPA protocol
☐ Neurologist

Clinics/Facilities

- ☐ Anticoagulation Clinic
☐ Stroke Acute Care Unit (or equivalent)
☐ Inpatient Rehabilitation Unit

Subjects and Methods

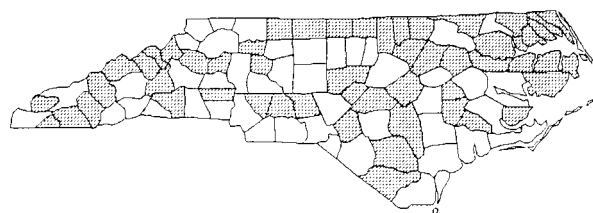
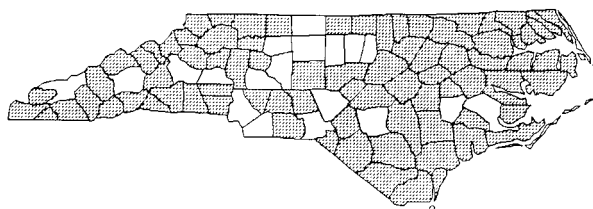
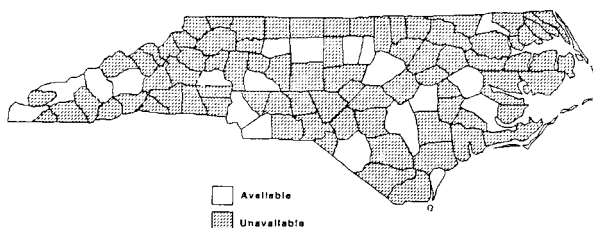
A list of all inpatient medical facilities in North Carolina ($n=125$) was obtained from the Division of Facilities. In January 1998, a 1-page survey (Table 1) was mailed to the medical directors of each facility, with a cover letter explaining its purpose signed by the study principal investigator and the deputy director of the state Department of Health and Human Services. Nonresponders were sent a second mailing, again asking them to complete the survey. The survey was then sent by fax to those not responding to the second mailing, with telephone follow-up as necessary.

Several categories of data were collected relating to the availability of basic and advanced stroke prevention and treatment facilities and programs. These included a variety of diagnostic studies useful in the management of patients with cerebrovascular disease and a series of programs and services (community stroke awareness programs; the performance of carotid endarterectomy; the availability of an emergency department, an acute stroke team, hospital stroke care map, an acute stroke identification program, stroke rtPA protocol, Stroke Acute Care Unit or its equivalent; and whether the hospital had a neurologist).

χ^2 statistics were used to compare the characteristics of facilities offering or not offering rtPA treatment. Population data were obtained from the last available census,¹¹ which permitted calculation of the proportion of the state's population residing in counties with hospitals providing treatment with rtPA and other stroke-related services.

Results

Responses were obtained from every inpatient facility in North Carolina, providing comprehensive statewide data.

t-PA Protocol**Stroke Teams****Stroke Unit or Equivalent**

Maps of North Carolina showing counties that contain medical facilities providing treatment of stroke patients with rtPA, having stroke teams, or having Stroke Acute Care Units or an equivalent.

These 125 facilities were located in 84 of the state's 100 counties.

Treatment with rtPA was offered in 54 hospitals in 46 counties (Figure). Seventy-four percent of the state's population resides in counties with these facilities. Table 2 compares the characteristics of medical facilities providing rtPA treatment with those not offering this therapy. Hospitals with stroke rtPA protocols had more inpatient beds (mean,

TABLE 2. Comparison of Characteristics of Medical Facilities Offering and Not Offering Treatment With rtPA for Ischemic Stroke

	rtPA Treatment, %	No rtPA Treatment, %	P
Community Awareness	41	17	=0.003
Stroke Team	31	8	=0.001
Stroke Care Map	56	17	<0.001
Stroke ID Program	33	6	<0.001
SACU	33	7	<0.001
Neurologist	78	38	<0.001

Community Awareness indicates stroke community awareness program; Stroke ID Program, rapid stroke identification program; SACU, Stroke Acute Care Unit or its equivalent; and Neurologist, presence of a neurologist on the hospital's medical staff.

301 and range, 46 to 1124 versus mean, 148 and range, 8 to 849; $P=0.0001$), more commonly sponsored stroke community awareness programs and more frequently had an organized stroke team, employed stroke care maps, had rapid stroke identification programs, had a Stroke Acute Care Unit or its equivalent, and had a neurologist on the medical staff. The Figure gives the geographic distribution by county of facilities providing rtPA treatment, having an organized stroke team, and having a stroke unit or its equivalent.

Discussion

This study provides the first comprehensive data describing the availability of treatment with rtPA for acute stroke in an entire state. In just over 1½ years since this novel treatment was approved by the Peripheral and Central Nervous System Drug Advisory Committee to the US Food and Drug Administration, this therapy has become available to a high proportion of North Carolina's citizens, based on their county of residence. This has likely been prompted by intensive efforts of the National Institutes of Health, the American Heart Association, the National Stroke Association, and a variety of other agencies to increase the awareness of both the general medical community and the lay population that stroke is a treatable disease. However, despite these efforts, 25% of North Carolina's population still resides in counties in which medical facilities capable of administering rtPA for acute stroke are not available. Although patients may still be transported to facilities in other counties for stroke-related care, because of the narrow time window for rtPA treatment local availability of facilities is critical. No hospital in 15 of North Carolina's 50 most populous counties currently offers rtPA treatment. Eighty-four percent of the state's population would reside in counties providing rtPA therapy if protocols were adopted by at least 1 facility in each of these counties. Similar analyses could be carried out in other states to target hospitals for development of the capability to administer rtPA for acute stroke.

These data have several other implications for the current organization of hospital-based stroke-related care. Although 78% of hospitals administering rtPA for acute stroke had at least 1 neurologist on their medical staff, 22% did not have a neurologist. Neurologists are currently involved in the care of a minority of stroke patients in the United States.^{12,13} Therefore, this relatively high proportion may reflect caution in the use of rtPA without neurological expertise. Only close ongoing surveillance will provide data to determine whether rtPA-related outcomes differ according to the specialty of the treating physician.

The International Stroke Trial found that only 4% of patients with acute ischemic stroke presented to the hospital within the first 3 hours after the onset of symptoms.¹⁴ Within the NINDS rt-PA trial, the most common reason that stroke patients did not receive rtPA treatment was because they did not arrive at the hospital in a timely fashion.¹ The general population is ordinarily not aware of stroke symptoms,¹⁵ making the development of effective public education programs critical.¹⁶ Although educational campaigns may originate from a variety of sources, less than half of the medical facilities providing rtPA had community stroke awareness

programs (less than 20% of hospitals not offering rtPA treatment had these types of programs). Based on these data, the need for local public education, particularly within stroke belt communities, needs further emphasis.

Once a patient reaches the hospital, acute stroke care is expedited by a mechanism for rapid patient identification and treatment.^{17,18} However, only one third of the hospitals with rtPA protocols also had rapid patient identification programs. In addition, the treatment of patients with acute stroke by an organized team^{19,20} and the use of stroke care maps^{21,22} have been associated with shorter hospital stays, fewer complications, and improved functional outcome. Although only high-volume centers can support a dedicated stroke unit,^{19,21-27} the provision of organized stroke care can be accomplished in many settings. Stroke care maps were used in just over one half of the hospitals with rtPA protocols, and stroke teams were organized in one third. Significantly fewer hospitals without rtPA protocols had these programs. Given their apparent benefit, more widespread adoption of organized care systems should be advocated.

These data show that rtPA, a new therapy for ischemic stroke, is potentially available to a high proportion of the North Carolina's citizens based on their county of residence. However, other services that may improve outcomes and reduce stroke-related costs (eg, stroke teams, stroke units, care maps) are not being widely used, even in centers providing treatment with rtPA. The simple methodology employed in this study is applicable in other states and permits targeting of selected centers for development of stroke treatment capabilities.

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