On May 20, 2008, the Tennessee General Assembly passed Senate Bill 4011. This act creates a comprehensive stroke registry managed by East Tennessee State University, College of Public Health, in collaboration with the Heart Disease and Stroke Prevention Program, and utilizes the American Heart Association’s*Get With The Guidelines*[GWTG] criteria. These guidelines assist healthcare teams to consistent heart and stroke care.

The stroke registry will include stroke treatment and outcome data from as many Tennessee hospitals as possible, with a focus on identifying areas for improvement. This partnership with a state university system represents an innovative approach to a public health problem. By partnering with the university, the taxpayers saved nearly half a million dollars and the American Heart Association took a significant step toward stroke data collection and treatment in Tennessee, one of 11 states in the nation’s stroke belt.

**Current Status:** The Tennessee Stroke Registry (TSR) has collected one year of data from July 2007 to June 2008. The database contains 4,747 cases representing approximately one-fourth of the strokes in the state. Three-quarters of the TSR cases are Caucasian and slightly more females than males suffering a stroke. The national trend that is that women are at greater risk for a stroke than men.

Tennessee’s Heart Disease and Stroke Prevention Plan will mobilize statewide efforts to use TSR data to guide improvement with stroke outcomes.

**Pre-stroke Awareness:** In Tennessee, the public’s knowledge of stroke warning signs and symptoms has increased from 2001 to 2005; and are significantly higher than the U.S. However, the knowledge varies by gender, race and age. Also, there is much less recognition of the risk factors for stroke and of the need to seek care rapidly.

![Figure 2: Percent of persons knowing all stroke warning signs](image_url)

The American Stroke Association, a division of the American Heart Association, used private, Tennessee Hospital Association and federal funds ($36,000) to produce and broadcast a “warning signs and symptoms” media campaign from May 1-31, 2006 and August 14-September 14, 2006. A total of 86,433,486 media impressions were generated across the state through this awareness campaign.

**Pre-Hospital Care:** Far too many Tennesseans do not call EMS when they have a stroke; they self-transport (Figure 3). TSR self-transport rates are similar to those reported by North Carolina (NCSR) and Georgia (GASR) stroke registries and vary by race and gender. Clinical outcomes are generally better using EMS transport since supportive care can be given en route. Also, clinical data may be transmitted to the hospital by EMS; this can increase the ‘readiness’ of the hospital to receive/manage the stroke rapidly.
Figure 3: Percent of stroke cases that self-transport.

One of the foremost aims for the Tennessee Heart Disease and Stroke Prevention Plan is to promote improvements in access to care. Toward this aim, $75,000 of federal and community funds have been invested to organize and provide Acute Stroke Life Support (ASLS) training for 150 hospital and pre-hospital [EMS] providers. This course addresses the pre-hospital management of patients with stroke. However, the greatest delay with care-seeking occurs between the onset of stroke symptoms and when the patient reaches the hospital. Patient education and recognition of the timeliness of care is sorely needed.

There are two major types of stroke: The most common is ischemic stroke [results from a vessel blockage (e.g., by a blood clot); these comprise 61.6 percent of the strokes in the TSR (Figure 4).

Figure 4: Percent of stroke admissions in the TSR by stroke type.

Next most common are hemorrhagic strokes [due to a vessel rupture (e.g., an aneurysm); these are 12.4 percent of the TSR data base. Hemorrhagic strokes are further subdivided into Subarachnoid [bleeding on surface of the brain] and Intracerebral (bleeding within the brain). These and all ‘other’ forms of stroke make up eight percent of the TSR data.

Transient Ischemic Attacks [TIAs], what some people call a ‘mini-stroke,’ account for 18 percent of the stroke admissions present in the TSR. TIA cases are at twice the risk of having a stroke in the following six months.

In-Hospital Care: The speed with which a patient is evaluated is crucial to the treatment decision. This timing includes the time from “last-known-well” to the hospital door. One-third of TSR cases arrive within two hours, one third in more than six hours from last-known well (Figure 5). The remainder of patients either arrived greater than six hours or the time period could not be determined. The ‘ideal’ scenario is less than three hours from symptom onset to treatment.

Figure 5: Arrival time to hospital.

Quality improvement for stroke care is the primary aim for the TSR. In the last five years, federal and community funding totaling [$71,000] has been given for development of Primary Stroke Centers and to promote implementing ‘Get With The Guidelines’ [GWTG] stroke systems in hospitals across Tennessee.

GWTG defines criteria for excellence with stroke care; Figure 6 shows how hospitals participating in the TSR have improved their quality of care over the last year. Smaller stroke centers [ones that see less than 500 strokes per year] and those in Appalachia have shown the steepest rise in quality of care, but all stroke centers are improving.
Currently, there are 11 Joint Commission certified Primary Stroke Centers in Tennessee, and another 15 stroke-ready programs [ones with a stroke management protocol, but who have not yet received national certification]. However, the map of the admissions for stroke among Medicare beneficiaries show the areas of Tennessee with heavy admissions for stroke care to be rather localized (Figure 7).

Disparities for stroke are great in Tennessee. There are 907,000 Tennesseans who are more than 50 miles from a Primary Stroke Center or 25 miles from a skilled stroke facility (see Figure 8).

A nationally respected technology program, called ‘telestroke,’ addresses the lack of access for residents of rural areas to stroke neurologists and to stroke certified hospitals; it is a ‘hub-and spoke’ system. Federal funds totaling [$60,000] are being used to implement a ‘telestroke’ pilot project in Tennessee. A stroke neurologist at an urban ‘hub’ hospital will provide consultation and guide emergency treatment in ‘real time.’ This system could overcome the loss of time associated with ground transportation of stroke patients from a rural ‘spoke’ facility to a stroke-certified hospital.

In addition to lack of access to specialized stroke care in the state, there are age disparities as well, that is, persons dying ‘earlier’ from a stroke (Figure 9). The differences in pre-mature deaths are greatest among African Americans, especially males. These disparities also vary by region of Tennessee, (e.g. stroke trends for Caucasian females in Appalachia).

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However, the risk of death due to cerebral hemorrhage is about 4.2 times more likely than with ischemic stroke. This risk of death is 6.6 times greater for Appalachia [6.6-fold], and 11.7 times greater for African Americans living in Appalachia.

**After Hospital Discharge:** The Tennessee Stroke Systems of Care Task Force, Rehabilitation Subcommittee aims to ensure every stroke survivor receives services to maximize recovery. $7000 of federal funds were used to develop an educational tool for case managers and discharge planners and was disseminated across the state. ([www.americanheart.org/strokerehabilitationtool](http://www.americanheart.org/strokerehabilitationtool)).

**Up-coming Reports:** A more complete and detailed report on the status of stroke in Tennessee will be released by the TSR in the spring of 2009. Besides the perspective of stroke cases in the TSR and monitoring for the quality of stroke care, another aspect of stroke in Tennessee is the scale of the burden of stroke and heart disease. The updated ‘Burden of Heart Disease and Stroke in Tennessee, 2009” is being compiled by the Center for Health Research at Tennessee State University in collaboration with the Tennessee Department of Health and will be released in the last quarter of 2009.

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