

ADDENDUM

*Chapter 1: Making the Case for
Population-based Cardiovascular
Health Interventions*

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Making the Case for Stroke Communication

Recent changes in stroke treatment provide opportunities for population-based and systems-change interventions. For example, recombinant tissue plasminogen activator (t-PA) treatment for acute stroke must be administered within 3 hours of a stroke event. Currently, only a tiny fraction of stroke victims arrive at the hospital in time for lifesaving and disability-sparing t-PA treatment. That is why it is critically important that bystanders or those with stroke symptoms call 9-1-1 to reduce the delay in getting the stroke patient to the hospital. Equally important is the need for health care providers to get systems in place to ensure that once patients present at the emergency department, they are seen by a neurologist, evaluated by CT scan, and treated with t-PA, if appropriate.

A GROWING BODY OF LITERATURE ADDRESSES the use of communication interventions to enhance awareness of stroke symptoms and increase the number of patients who arrive at the hospital in time to be eligible for acute stroke treatment. Although various studies have shown that communication and education can facilitate timely and effective care for acute stroke, few have been replicated to validate their findings. Also lacking are comparisons that would show which communication elements are the most effective and, therefore, the best candidates for widespread implementation.

The studies reviewed here document a lack of knowledge among the public about stroke signs and symptoms, risk factors, and the necessity of calling 9-1-1 if someone appears to be having a stroke. They also offer some insights into how communication and education interventions have been used to boost awareness of signs and symptoms of stroke and increase communities' treatment rates for ischemic stroke. Others document success with behavioral interventions for medical professionals and with systems changes implemented within hospitals.

Looking across the studies reveals some findings that could serve as a basis for communication and education interventions to decrease stroke patients' "time to hospital" and decrease the "time to needle" once they arrive at the hospital:

- Multifaceted efforts that combine multiple communication channels (for example, those using mass media and in-person communication in combination with systems changes in health care settings) are more effective than single-channel communications for reducing patient delays.
- Television is often cited in surveys of the public as the main source of information about stroke. Low-level, intermittent television advertising has been shown to increase public awareness of the warning signs of stroke as effectively as continuous, high-level television advertising.
- Public service advertising (print and broadcast) has been effectively used to increase knowledge of the signs and symptoms of stroke but has not yet been shown to decrease patient delay in calling 9-1-1 or getting to the hospital.
- People at highest risk of stroke are the least knowledgeable about stroke warning signs and risk factors.
- Interventions that target medical professional behavior or involve systems-level change at hospitals have led to significant and sustainable increases in numbers of patients receiving timely acute-stroke care.
- Because bystanders are more likely to place an emergency medical services (EMS) call than are stroke patients themselves, caregivers, coworkers, and family members need to know the importance of dialing 9-1-1.

Following are summaries of articles reviewed:

Effects of Public and Professional Education on Reducing Delay in Presentation and Referral of Stroke Patients

Stroke, March 1992

This study evaluated the effectiveness of educational efforts aimed at reducing patients' time in getting to the hospital when they experience strokes. During the time of the study, trials for many acute stroke therapies were being conducted, including the trials for tissue plasminogen activator (t-PA). The study took place at Duke University Medical Center from November 1985 through January 1987 and again from January 1988 through December 1988. Between these time periods, study coordinators completed a communication intervention, which included paid radio and television advertisements and newspaper coverage. In addition, study coordinators provided materials for primary care physicians, encouraging them to refer patients to Duke. Before the educational efforts were initiated, 37% of patients presented to the hospital within 24 hours of symptom onset; after the educational efforts, this figure increased to 86%. The study concluded that patients who received messages from television, radio, or newspaper outreach or those who were referred through their physicians significantly reduced delay time in getting to the hospital.

Alberts MJ, Perry A, Dawson DV, Bertels C. Effects of public and professional education on reducing the delay in presentation and referral of stroke patients. *Stroke* 1992;23(3):352-6.

Critical Factors Determining Access to Acute Stroke Care

Neurology, August 1998

The DASH study, conducted in Texas from 1995 through 1997, assessed the roles of gender, ethnicity, and access to care in delay time for presentation at a hospital for stroke treatment. Data were obtained through documentation of stroke patients by emergency departments. The median delay was 222 minutes for African-American patients, 230 minutes for non-Hispanic whites, and 280 minutes for Hispanic-Americans. In addition, the study found that a neurologic consultation was completed within 3 hours of symptom onset for 28% of African-American patients, 34% of non-Hispanic whites, and 18% of Hispanic-Americans. The investigators concluded that gender and access to care, in addition to race/ethnicity, might be important determinants in the delay time for stroke patients presenting to the hospital.

Menon SC, Pandey DK, Morgenstern LB. Critical factors determining access to acute stroke care. *Neurology* 1998;51(2):427-32.

Rapid Response to Stroke Symptoms: The Delay in Accessing Stroke Healthcare (DASH) Study (Abstract)

Academic Emergency Medicine, January 1998

The DASH study, conducted from July 1995 to March 1996, assessed causes for delay in getting stroke patients to a hospital by using data from registered patients with signs and symptoms of stroke. Investigators found the median delay to be three hours and noted that delay was shorter when a bystander recognized the signs of a stroke and when EMS was utilized for transport to the hospital.

Rosamond WD, Gorton RA, Hinn AR, Hohenhaus SM, Morris DL. Rapid response to stroke symptoms: the Delay in Accessing Stroke Healthcare (DASH) Study. *Academic Emergency Medicine* 1998;5(1):45–51.

Activation of Emergency Medical Services for Acute Stroke in a Nonurban Population: The TLL Temple Foundation Stroke Project

Stroke, August 2000

As part of the TLL Temple Foundation Stroke Project to identify target populations for stroke education, the investigators used chart abstraction and structured interviews for hospitalized stroke patients in nonurban East Texas to determine if EMS was activated and, if so, by whom. From February through October 1998, 429 stroke patients were documented at participating hospitals. EMS was contacted for transport in only 38% of these cases, and only 4.3% of acute stroke patients placed calls themselves to EMS.

In the subset of 38% of the stroke patients transported by EMS, a family member or significant other called EMS for 60.1%, a paid caregiver called for 18.4%, and a coworker or others called for 12.9% of the group. Employed individuals in this subset were 81% less likely to have EMS activated; this finding may imply coworkers transport patients to a hospital instead of contacting EMS.

These data suggest that bystander and caregiver messages may be important to minimize delays for time-dependent acute therapy for stroke patients and that educational programs should target family members, paid caregivers, and coworkers of those at greatest risk of a stroke.

This study found no significant connection between gender and insurance status for activating the EMS system but did note that whites and men were more likely to have a bystander activate EMS.

Wein TH, Staub L, Felberg R, Hickenbottom SL, Chan W, Grotta JC, et al. Activation of emergency medical services for acute stroke in a nonurban population: the TLL Temple Foundation Stroke Project. *Stroke* 2000;31(8):1925–8.

Acute Stroke Care in Non-urban Emergency Departments

Neurology, December 11, 2001

This study, conducted as part of the TLL Temple Foundation Stroke Project, assessed practice patterns in East Texas rural emergency departments for acute stroke. The data were collected in two counties, and 10 hospitals were evaluated in total. All hospitals possessed equal resources for care (e.g., neurologist, CT scan, EMS availability). The study was conducted from February through November 1998, and 429 patients were determined to have had strokes. Of the 429 patients, 59% were women, 20% were African-American, and less than 2% were Hispanic. Risk factors for these patients included hypertension, previous stroke, former and current smoking, coronary artery disease, diabetes, and atrial fibrillation. All patients received similar emergency department care, regardless of age, gender, and race. Intravenous t-PA was administered in 1.4% of ischemic stroke cases. Also noted was a lack of use of the NIH Stroke Scale, although it is a valid means for assessing stroke patients, and its implementation does not delay patient treatment.

The investigators concluded that the role of the neurologist in stroke care remains undefined, and that if neurologists were to assume a leadership role in patient care, quality of care for stroke patients might improve. They also found that acute stroke care in this representative non-urban community frequently does not follow nationally published guidelines (e.g., not all patients receive CT scans), although they noted that published guidelines are not always followed strictly in some of the largest urban hospitals.

Burgin WS, Staub L, Chan W, Wein TH, Felberg RA, Grotta JC, et al. Acute stroke care in non-urban emergency departments. *Neurology* 2001;57(11):2006–12.

Trends in Community Knowledge of the Warning Signs and Risk Factors for Stroke

Journal of the American Medical Association, January 2003

This study examined temporal trends in public knowledge of stroke signs and symptoms as well as stroke risk factors. Investigators used random-digit dialing to survey more than 2,000 people in five counties in the Cincinnati area to assess respondents' knowledge of stroke symptoms, stroke risk factors, and personal demographic data. When comparing results of the 2000 survey with the same survey conducted in 1995, study coordinators determined that the knowledge of stroke warning signs had improved significantly during the five years between surveys, although knowledge of risk factors did not. Most respondents commented that television and their primary care physician were sources for their knowledge about stroke. These results led the investigators to conclude that educational efforts can significantly increase knowledge about stroke and that such programs should focus on those who are at the greatest risk of stroke.

Schneider AT, Pancioli AM, Khoury JC, Rademacher E, Tuchfarber A, Miller R, et al. Trends in community knowledge of the warning signs and risk factors for stroke. *Journal of the American Medical Association* 2003;289(3):343–6.

Advertising Strategies to Increase Public Knowledge of the Warning Signs of Stroke

Stroke, August 2003

This study was undertaken by the Heart and Stroke Foundation of Ontario to track knowledge of the warning signs of stroke in four communities and to evaluate the impact of different media strategies. Data were collected through telephone surveys in both control and intervention communities before and after mass media campaigns. The study found that both men and women under 65 years of age in communities exposed to television advertising increased their ability to recognize stroke symptoms significantly more than those in unexposed communities, although there was no significant increase in recognition by people aged 65 years or older. There was no significant change in the community receiving print (newspaper) advertising. Intermittent, low-level television advertising was as effective as continuous, high-level television advertising.

Silver FL, Rubini F, Black D, Hodgson CS. Advertising strategies to increase public knowledge of the warning signs of stroke. *Stroke* 2003;34(8):1968–9.

Sustained Benefit of a Community and Professional Intervention to Increase Acute Stroke Therapy

Archives of Internal Medicine, October 2003

The investigators assessed the sustainability of the effects of community and professional educational interventions related to stroke. This final part of the TLL Temple Foundation Stroke Project ran from January 1999 through March 2000 and involved targeting a community with stroke information in television and radio public service announcements, posters, educational brochures, billboards, and training sessions. The communication interventions provided more than 49,000 residents with messages about signs and symptoms of stroke, the importance of acting quickly to get to the hospital, and the value of asking for intravenous t-PA, if appropriate. To educate physicians about the importance of improved acute stroke care, the intervention relied upon systems change within hospitals. Success stories were highlighted, and protocols were developed for stroke treatment.

During the intensive interventions, significantly more patients with acute stroke received intravenous t-PA than in the control community. The researchers then determined utilization rates of intravenous t-PA for stroke patients from April through September 2000, six months after the cessation of the educational interventions. During this time, 238 validated acute strokes were documented, and 11.3% of acute ischemic strokes were treated with intravenous t-PA—a tenfold increase over the national average. The researchers noted that the professional intervention was clearly successful and led to a 55.6% increase in the treatment of eligible candidates. The study had significant impact on primary care providers and internists who prompted the change in protocol within their institutions.

Delay time for stroke patients to receive treatment was largely unaffected during this study, though the investigators noted their belief that messages constantly targeted at appropriate audiences likely would improve response times for patients.

Morgenstern LB, Bartholomew LK, Grotta JC, Staub L, King M, Chan W. Sustained benefit of a community and professional intervention to increase acute stroke therapy. *Archives of Internal Medicine* 2003;163(18):2198–202.

Low Public Recognition of Major Stroke Symptoms

American Journal of Preventive Medicine, November 2003

This study was conducted by the Cardiovascular Health Branch of the Centers for Disease Control and Prevention (CDC) to measure the level of awareness for the warning signs of stroke. The 61,019 adults who participated in the 2001 Behavioral Risk Factor Surveillance System were asked if they could identify the major symptoms of stroke from a nonspecific list of symptoms.

It was found that only 17.2% of respondents could correctly classify all stroke symptoms and indicated they would call 9-1-1 if they thought someone was having a stroke. Recognition and knowledge of stroke were notably low among ethnic minorities, younger and older people, those with less education, and nonsmokers. There were no substantive differences by history of hypertension, diabetes, heart disease, or stroke. It was concluded that public recognition of the five major stroke symptoms is low and that increasing knowledge of stroke urgency requires education campaigns both to increase awareness among general audiences and to target high-risk persons.

Greenlund KJ, Neff LJ, Zheng ZJ, Keenan NL, Giles WH, Ayala CA, et al. Low public recognition of major stroke symptoms. *American Journal of Preventive Medicine* 2003;25(4):315–9.

Factors Associated with Hospital Arrival Time for Stroke Patients

Journal of Neuroscience Nursing, June 2004

This study investigated factors associated with hospital arrival time for stroke patients. The investigators used descriptive, cross-sectional data from a convenience sample of 50 stroke survivors and/or their companions in Indianapolis, Indiana. Behavioral data were obtained regarding transportation, action time, the decision to seek hospital care, and alerting signs, among others.

It was found that only 28.9% of patients arrived at the hospital within 3 hours of the first warning sign of stroke, with the mean arrival time for the group being 5.5 hours. Mode of transportation and perceived adequacy of income were the only significant factors associated with the length of delay. Patients arriving in private car or taxi and those describing their incomes as comfortable had the longest delays. This information suggested public education efforts also should target people from higher socioeconomic groups. Non-significant associations between hospital arrival time, warning signs, and other demographic characteristics suggest there may be other unmeasured behavioral factors that play important roles in the delay time before stroke patients present to the hospital.

Maze LM, Bakas T. Factors associated with hospital arrival time for stroke patients. *Journal of Neuroscience Nursing* 2004;36(3):136–41, 155.

Awareness of Stroke Warning Signs—17 States and the U.S. Virgin Islands, 2001

Morbidity and Mortality Weekly Report, May 2004

This article documents CDC's efforts to evaluate stroke education as part of its leadership role in pursuing the goals of Healthy People 2010. As mentioned in the foregoing synopsis of Greenlund et al.'s article, "Low public recognition of major stroke symptoms," an analysis of 2001 Behavioral Risk Factor Surveillance data from 17 states and the U.S. Virgin Islands showed that public awareness of several stroke signs is high, but the ability to recognize all five major warning signs is low. Of the five major stroke warning signs, public awareness of three is high: sudden numbness or weakness of the face, arm, or leg; sudden confusion, trouble speaking, or understanding; and sudden trouble walking, dizziness, or loss of balance or coordination. The signs least recognized were sudden trouble seeing in one or both eyes and sudden, severe headache with no known cause. Approximately 37.8% of respondents incorrectly reported chest pain as a sign of a stroke. Education campaigns are needed to increase public awareness of stroke signs and the necessity of calling 9-1-1 when someone is suffering a possible stroke.

Centers for Disease Control and Prevention. Awareness of stroke warning signs—17 states and the U.S. Virgin Islands, 2001. *Morbidity and Mortality Weekly Report* 2004;53(17):359–62.

ADDENDUM 1