Stroke Patient Systems of Care: What Systems and Methodologies Exist Nationally that Optimize the Care of Stroke Patients?

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Learning Objectives

- Establish the key concepts that guide the decision making in the diagnosis and treatment of acute ischemic stroke patients.
- Evaluate stroke care systems, the role of tertiary and stroke centers, prehospital triage, and ED patient transfer in the management of acute ischemic stroke patients.
- Discuss which attributes of successful stroke care systems enhance outcome, such that they can be replicated in other systems and institutions for stroke patient benefit.

Background

Advanced stroke diagnostics and therapeutics are available both in JCAHO designated stroke centers and tertiary centers. Stroke care systems utilize triage and transfer protocols and cutting edge technologies in order to optimize the initial evaluation and subsequent management of acute ischemic stroke patients. How stroke center designation, management protocols, and technologies such as robotics and telemedicine enhance patient outcome in 2007 needs to be fully understood.

Key Clinical Questions and Learning Points

What is the current status of primary stroke center designation?

Alberts, M.J., Hademanos, G., Latchaw, R.E., Jagoda, A., et al. Recommendations for the Establishment of Primary Stroke Centers, JAMA, June 2000; 283;23, 3102-3109.

This article established the 11 elements that hospitals need to have in place for JACHO to certify them as a primary stroke center. The elements were designed to improve the efficiency with which patients are treated in the ED and to prevent secondary complications from stroke.

The eleven elements are:
1) Acute stroke team
2) Written care protocols
3) Emergency Medical services
4) Emergency department
5) Stroke unit
6) Neurosurgical services
7) Commitment and support from administration
8) Neuroimaging
9) Laboratory services
10) Quality improvement activities
11) Continuing medical education

There are approximately 5000 hospitals in the US. As of June 18th 2007 there are 352 hospitals that are JCAHO certified in 40 states. Another 94 applications are in process.

What is the current status of tertiary stroke center designation?

Alberts, M.J., Latchaw, R.E., Selman, W.R., Shephard, T., et al., Recommendations for Comprehensive Stroke Centers, A consensus statement from the brain attack coalition. Stroke, July 2005; 36:1597-1618.

This article reviews the literature and makes recommendation for the elements necessary to become a comprehensive stroke center. There are five

broad elements that are proposed for comprehensive stroke center designation.

1) Health care personnel with specific expertise
    - Vascular neurology
    - Vascular neurosurgery
    - Critical care
2) Diagnostic techniques
    - MRI, diffusion, perfusion
    - CTA
    - Carotid duplex
3) Surgical intervention
    - Aneurysm clipping
    - Ventriculostomy placement
4) Infrastructure
    - ICU
    - OR
    - Stroke registry
5) Education
    - Community education
    - Community prevention
    - CME

JCAHO has not established a certification process for comprehensive stroke centers at this time but will likely do so in the next 2 years.

What regional or national stroke systems currently exist?

The Paul Coverdell Prototype Registries Writing Group, Acute Stroke Care in the US, Results from 4 Pilot Prototypes of the Paul Coverdell National Acute Stroke Registry, Stroke, June 2005;36:1232-1240.

A national stroke registry exists, implemented at the state level that is actively collecting data on stroke patient demographics, treatment, and outcomes. This particular article studies 6867 stroke admissions at 98 hospitals in 4 states (MI, GA, OH, MA). Less that 2/3 had documented onset times. Less than 50% had dysphagia screening (45%), lipid testing (34%), and smoking cessation counseling (21%). 3% received tPA in MI, GA, OH, while 8% received tPA in MA. The authors concluded that only a minority

of acute stroke patients are treated according to established guidelines. As more data from the Coverdell registry is published protocols will be redesigned to improve compliance with the established guidelines which may reveal a benefit in outcomes.

What networks for evaluation, consultation, and transfer exist?

Many different consultation and transfer arrangements exist throughout the US. They are often region specific. For example, Dr. Paul Katz, medical director Washoe Stroke Center at the Washoe Health System in Reno Nevada has established a comprehensive transfer arrangement with 25 rural emergency departments surrounding Reno. All 25 use the same protocol which involves rapid assessment, phone consultation with Dr. Katz or one of his 3 partners, and transfer to Washoe either with or without therapy being initiated prior to transfer. Dr. Katz visits each of the 25 rural hospitals each year to update protocols and assure compliance. Networks such as this exist in both rural and urban settings and help to raise the treatment of stroke patients to a common norm.

How are telemedicine systems utilized in these stroke systems?

Schwamm, L.H., Rosenthal E.S., Hirshberg, A., Schaefer, P.W., et al. Virtual TeleStroke support for the emergency department evaluation of acute stroke. Acad. Emerg. Med. Nov. 2004; 11(11):1193-1197.

Telemedicine, the use of two-way videoconferencing to connect a treating physician with a remote consultant, has developed as a management option for the treatment of acute stroke patients in hospitals without the resources to provide acute stroke care. This pilot study used telemedicine consultation on 24 acute stroke patients. 6 received tPA with a door to needle time of 106 (+/- 22) minutes and a consult to needle time of 36 (+/- 15) minutes. There were no protocol violations and transfer was not necessary in 11 patients. Though only a pilot study telemedicine may not only help to increase the number of stroke patients receiving therapy but may also assist in delineating a group of patients that can receive optimal treatment at the originating hospital thus improving the utilization of scarce resources.

What are the documented benefits and outcome enhancements for stroke patients who are treated in these systems?

Douglas, V.C., Tong, D.C., Gillum, L.A., Zhao, S., et al. Do the Brain Attack Coalition's criteria for stroke centers improve care for ischemic stroke? Neurology Feb. 2005;64:422-427.

To date there is very little data supporting outcome improvement with the use of specific guidelines or protocols. Most of the existing data concentrates on the improvement in compliance with protocols and thus the possibility of improving outcomes. This article assessed the correlation between the eleven elements of the primary stoke center certification (see above) and outcomes in 16,853 stroke patients from 34 academic medical centers. The in-hospital mortality rate was 6.3% and 2.4% of patients received tPA. None of the eleven elements decreased in-hospital mortality or increased the frequency of discharge to home. Four of the elements predicted increased tPA use, written care protocols, integrated EMS, organized emergency department and CME.

Gropen, T.I., Gagliano, C.A., Blake, C.A., Sacco, R.L., et al. Quality improvement in acute stroke. The New York state stroke center designation project. Neurology, July 2006;67:88-93.

This article involved 32 hospitals in Brooklyn and Queens comparing stroke treatment before implementation with the BAC guidelines with treatment after guideline implementation. From baseline to remeasurement the use of tPA increased from 2.4 to 5.2%. Protocol violations decreased from 11.1 to 7.9%. Overall there was improvement in door to doctor, door to CT and door to needle times. However, peri-stroke complications and discharge to home were not improved. These two articles would seem to indicate that compliance with guidelines increases treatment and decreases protocol violations, more work needs to be done to study the impact of patient care protocols on overall stroke patient outcomes.