Policy Commentary

Transitions of Care for Stroke Patients
Opportunities to Improve Outcomes

Joseph P. Broderick, MD; Mahshid Abir, MD, MSc

Advances in Stroke Care and Prevention
The last 30 years have seen tremendous progress in primary and secondary stroke prevention in the United States with better control of hypertension, decreasing smoking rates, antithrombotic treatment for atrial fibrillation, use of statins, and blood transfusions for children with sickle cell disease. In 1996, intravenous tissue-type plasminogen activator was approved for treatment of acute ischemic stroke; and in 2014 to 2015, endovascular treatment of major arterial occlusion, primarily by stent retrievers, was demonstrated to result in better outcomes for patients with ischemic stroke when compared with patients treated with intravenous tissue-type plasminogen activator alone. During this same time period, the field of neurocritical care grew tremendously in terms of physician and nurse training, standardization of care, and technology. Finally, standardization and certification of primary and comprehensive stroke centers have improved the quality of acute stroke care and the use of secondary prevention medications when patients are hospitalized for acute stroke. These cumulative advances have resulted in the decline in stroke mortality rates from the third to the fifth cause of death in the United States.

The bulk of these advances have occurred in 2 settings—the office of primary care physicians who manages stroke risk factors in persons with and without a prior stroke; and the acute care hospital. Yet, the stroke patient follows a complex path from first onset of symptoms to the years after the onset of stroke, and the transitions between the respective places of care along the path represent major challenges and opportunities.

Transition From Place of Stroke Onset to Acute Hospital
One of the first major transitions of care is when emergency medical services (EMS) respond to a 911 call for a potential stroke. EMS personnel assess the patient at the site of the event with input from family or other witnesses to see whether a stroke has occurred. After assessment, EMS has to transport the patient to a hospital for treatment of their potential stroke. Unlike trauma patients, where there is a defined process of triage to various levels of hospital care based on severity of the trauma and prior certification of hospitals regarding level of care, there is no such triage process for stroke patients. Legislation in several states and a policy statement from the American Heart Association (AHA) recommend that patients with a possible acute stroke be taken to a primary or comprehensive stroke certified hospital, but current triage of patients to a given hospital is not based on severity of the stroke.

Why is this important? Stroke severity is strongly associated with the presence of large artery occlusions in patients with ischemic stroke, which are most effectively treated with rapidly administered endovascular therapy at regional comprehensive stroke centers. Also, patients with severe hemorrhagic stroke are best cared for in centers with experienced neurocritical care units. Thus, ideally, patients with severe stroke should be transported directly to a comprehensive stroke center rather than taken to the nearest hospital, unless the comprehensive stroke center is substantially further away. As yet, there is no currently accepted diagnostic method for EMS personnel to identify those patients with a more severe stroke. Several abbreviated stroke severity scales, such as the Cincinnati Stroke Triage Assessment Tool (C-STAT), the 3-Item Stroke Scale (I3SS), the Los Angeles Motor Scale (LAMS), or the Race Arterial Occlusion Evaluation Scale (RACE), have been proposed and are in various stages of testing. Another method of triage currently being tested in a few communities is the use of ambulances equipped with brain imaging and assessment by a stroke physician in person or by telemedicine. Regardless of whether systems use low-tech or more resource intensive approaches to stroke triage, we urgently need regional approaches to assess and triage stroke patients so we can deliver the best therapy as quickly as possible. Such approaches must focus on patient outcomes and national or state certification of levels of acute stroke care at regional hospitals rather than market share of competing hospital systems.

Transitions From Acute Care Hospital to Other Medical Care Facilities and Home
The next major transition for stroke patients and their families is at discharge from the hospital which can be to home, to a skilled nursing facility, or to a rehabilitation hospital. This transition is a complex process, which first requires an assessment of the functional status of the patient by the physicians, therapists, and social workers and which determines where the patient should go or even can go. This decision and the timing of hospital discharge are heavily influenced by their medical....
transitions of care represent great opportunities for improved
care of stroke patients over the next decade which must start
now. Success will depend on regionally organized and integrated
stroke care within a given system or coordination across health
systems through a patient-centered home for stroke as has been
done for primary care, advocacy and legislation at the state and
federal level for stroke triage and rehabilitation care following
stroke, and implementation of currently available and develop-
ing technologies that connect the disabled stroke patient and
their family with health professionals and their support system.

Disclosures

Dr Broderick reports research monies to the Department of Neurology
and Rehabilitation Medicine from Genentech for his role on the
Executive Committee for A Study of the Efficacy and Safety of Activase
(Alteplase) in Patients With Mild Stroke (PRISM) Trial and monies to
the Department of Neurology and Rehabilitation Medicine from Pfizer
as a consultant for a potential stroke trial. Dr Abir reports no conflicts.

References

1. Broderick JP, William M. Feinberg Lecture: stroke therapy in the
year 2025: burden, breakthroughs, and barriers to progress. Stroke.
2. NINDS rt-PA Stroke Study Group. Tissue plasminogen activator for acute
3. Powers WJ, Derdeyn CP, Biller J, Coffey CS, Hoh BL, Jauch EC,
Johnston KC, Johnston SC, Khalesi AA, Kidwell CS, Meschia JF,
Ovbiagele B, Yavagal DR: American Heart Association Stroke Council.
2015 American Heart Association/American Stroke Association Focused
Update of the 2013 Guidelines for the Early Management of Patients With
Acute Ischemic Stroke Regarding Endovascular Treatment: A Guideline
for Healthcare Professionals From the American Heart Association/
STR.0000000000000077.
4. Lefler D, Bravata DM, Conners JJ 3rd, Hinchee JA, Jauch EC, Johnston
SC, Latchaw R, Lisjoksy W, Ogilvy C, Qureshi AL, Summers D, Sung GY,
Williams LS, Zorowitz R: American Heart Association Special Writing
Group of the Stroke Council; Atherosclerotic Peripheral Vascular Disease
Working Group; Council on Cardiovascular Surgery and Anesthesia;
Council on Cardiovascular Nursing. Metrics for measuring quality of
care in comprehensive stroke centers: detailed follow-up to Brain Attack
Council comprehensive stroke center recommendations: a statement for
healthcare professionals from the American Heart Association/ 
STR.0b013e318208eb699.
5. Song S, Saver J. Growth of regional acute stroke systems of care in the
1978. doi: 10.1161/STROKEAHA.112.657809.
Stroke Council Update: Sea Change for Stroke and the American Stroke
7. Higashida R, Alberts MJ, Alexander DN, Crocco TJ, Demaerschalk BM,
Derdeyn CP, Goldstein LB, Jauch EC, Mayer SA, Meltzer NM, Peterson
ED, Rosenwasser RH, Saver JL, Schwamm L, Summers D, Wechsler
L, Wood JP: American Heart Association Advocacy Coordinating
Committee. Interactions within stroke systems of care: a policy state-
ment from the American Heart Association/American Stroke Association.
and validation of a prehospital scale to predict stroke severity: Cincinnati
Prehospital Stroke Severity Scale. Stroke. 2015;46:1508–1512. doi:
10.1161/STROKEAHA.115.008804.
9. Diringer MN, Edwards DF. Admission to a neurologic/neurosurgical
intensive care unit is associated with reduced mortality rate after intracere-
10. Parker SA, Bowry R, Wu TC, Noser EA, Jackson K, Richardson L,
Perse D, Grotta JC. Establishing the first mobile stroke unit in the United
WG. Characterizing The “Universe” Of Transitional Care Programs For

Call to Action and Opportunity to Improve
Outcomes After Stroke

As early as the year 2000, The Institute of Medicine and
National Quality Forum identified evaluating transitions of
care from acute care facilities to other care settings and
home as a national priority.12–14 Given that funding sources, such as the
Patient-Centered Outcomes Research Institute (PCORI),
have invested upwards of $30 million toward clinical research
in transitions of care, it is obvious that substantial gaps remain.
The stroke population has been described as the ideal model for
studying complicated transitions and for improving the quality
of transitional care programs because of the commonality and
complexity of their transitions.15 Medicare beneficiaries with
acute stroke have a 30-day readmission rate of 14.4%, with 1
in 8 of these readmissions being judged as preventable.16 Thus,


Keywords: emergency medical services • hypertension • rehabilitation • stroke • tissue plasminogen activator
Transitions of Care for Stroke Patients: Opportunities to Improve Outcomes
Joseph P. Broderick and Mahshid Abir

Circ Cardiovasc Qual Outcomes. 2015;8:S190-S192
doi: 10.1161/CIRCOUTCOMES.115.002288
Circulation: Cardiovascular Quality and Outcomes is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2015 American Heart Association, Inc. All rights reserved.
Print ISSN: 1941-7705. Online ISSN: 1941-7713

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circoutcomes.ahajournals.org/content/8/6_suppl_3/S190

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation: Cardiovascular Quality and Outcomes can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation: Cardiovascular Quality and Outcomes is online at:
http://circoutcomes.ahajournals.org//subscriptions/