Improving Stroke Diagnosis and Treatment: An International Collaborative Initiative

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The diagnosis and treatment of stroke represent clinical challenges of critical importance. In the United States, stroke had an estimated prevalence of 3.2% in 2012 [1] and is currently the fourth leading cause of death [2]. Given the increasing age of the U.S. population [3], health care costs attributed to stroke management are estimated to rise from $70 billion to $184 billion by 2030 [1]. An effective approach for screening asymptomatic individuals is lacking—only 38% of individuals in one survey were aware of all major symptoms [4]. In addition, only a small majority of patients who undergo revascularization exhibit more functional improvement than would otherwise be anticipated, and there is no reliable technique for identifying such patients prior to intervention. Thus, there is a compelling need for investigation into stroke diagnosis and treatment, with pursuit of new solutions to address these challenges.

As part of the ARRS 2014 Annual Meeting Global Exchange program, ARRS and the Chinese Society of Radiology (CSR) jointly sponsored a focus group session pertaining to stroke diagnosis and treatment, with pursuit of new solutions to address these challenges. The session, moderated by Alexander Norbash, an interventional neuroradiologist and chair of radiology at Boston University Medical Center, was attended by leaders with relevant background and expertise from both societies. The session provided an opportunity for more-effective sharing of experiences, mutual learning, and bridge building as a foundation for future international collaboration to improve stroke management.

The overarching theme of the dialogue was the substantial variation among current care pathways for stroke. For example, centers vary in their preference of initial diagnostic imaging modality. Some choose routine CT alone; some, CT with CT perfusion and/or CT angiography; and some prefer MRI, including diffusion-weighted imaging. Among these modalities, there is further variation in scan durations, acquisition parameters, and interpretation schemes. The use of diagnostic catheter angiography in patients with subarachnoid hemorrhage is highly variable, as well. Therapy is similarly variable, with differences in preference for thromboextraction, intravenous or intraarterial thrombolysis, and thrombofragmentation. Acceptable windows for performing these interventions are not standardized; the delay from presentation until initiation of therapy is tremendously discrepant among centers, and the procedures are prone to substantial operator variation in their technique. Such extensive variation throughout clinical pathways greatly hinders the medical community’s ability to learn from outcomes pooled from large numbers of patients and to improve care patterns over time.

In an initiative to address this variation, the focus panel explored creation of a national or international registry of stroke patients that would contain details relating to patient diagnosis, treatment, and clinical outcome. Such a large-scale database would foster the sharing of experiences and insights among centers, and empower investigators to better understand which patients benefit from particular tests and interventions. The registry could facilitate the identification of centers obtaining the best outcomes, thereby providing a model to be emulated by other institutions. While the creation of a registry itself would neither require nor resolve discrepancies in preferred management algorithms, a registry would, at the very least, establish a formalized mechanism for documenting such disagreements and ultimately achieve collective (rather than individualized) learning.

Another key area of discussion pertained to the potential benefits of consolidation of diagnostic and therapeutic stroke services in a given geographic region. Such dedicated stroke centers could achieve a very high level of expertise in stroke management, and would be well positioned to standardize stroke care throughout a region. The centers would offer the unique benefits of taking comprehensive responsibility for stroke care in their regions. Care could include partnership with ambulatory care services (e.g., portable CT units and initiation of thrombolytic therapy in the ambulatory setting) and with telemedicine services (e.g., use of handheld devices for monitoring patients and interpreting images from smaller hospitals that, in turn, would assist triage of patients for...
transfer to the primary stroke center). Successful implementation of these large regional stroke centers would likely require establishment of rigorous criteria for a center to achieve such status, including adherence to stroke-specific training programs, credentialing examinations, certification processes, and compliance metrics.

Despite these benefits, creation of regional stroke centers with standardized management pathways poses a substantial organizational challenge that may not be practical in all settings. The model works best in areas that already have a single, large medical center that is dominant in its community; indeed, current successful stroke centers fit this model. Successfully establishing a new regional stroke center will be more difficult in regions that have a number of major institutions. Health care reform per the Affordable Care Act (ACA) of 2010 may help address this problem. The ACA encourages the formation of accountable care organizations and broad health care networks that take responsibility for the comprehensive management of large patient populations. The law also encourages and provides incentives for reporting clinical outcome measures in standardized formats. These large networks would likely be able to realize heightened alignment among their practitioners, who will thereby be more motivated to achieve standardized and optimized care benchmarks for such common medical conditions as stroke.

The focus session also addressed the need for much greater promotion of public education about stroke symptoms and the urgency of treatment. In contrast to most people’s general knowledge of cardiac risk factors and symptoms, the public generally has a much lower level of awareness of the clinical aspects of stroke. Public education would emphasize the most common symptoms and the need to seek immediate medical care when those symptoms occur. A curriculum could be established to standardize training for physicians in providing such public outreach. Public education could be integrated with outreach efforts that some centers now provide to educate patients at high risk for cardiac events.

During the focus session, the impact and importance of stroke as a major national health care problem in both the United States and China was clear. Nonetheless, differences in the two nations’ experiences were identified. First, stroke mortality is increasing in China but not in the United States, the reason for which is uncertain. In addition, China’s health care centers must deal with differences in the two nations’ health care systems. Key focus areas for future synergistic work were identified. It is anticipated that these efforts will help to elucidate the optimal diagnostic and therapeutic approaches for stroke management and to help standardize care. If successful, this collaborative process will achieve better care and improved outcomes for stroke patients around the world.

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During the focus session, insightful dialog was initiated during the focus session. This initial dialog is intended to serve as the beginning of—and the inspiration for—much deeper discussion between the two societies. Key focus areas for future synergistic work were identified. It is anticipated that these efforts will help to elucidate the optimal diagnostic and therapeutic approaches for stroke management and to help standardize care. If successful, this collaborative process will achieve better care and improved outcomes for stroke patients around the world.
More detailed analysis is periodically conducted and fed back to participating institutions; data have also been used in case studies and other papers, which can be accessed at: www.raer.org.au/publications-presentations.html.

**Can you share some of the lessons already learned from the program?**

There are so many lessons in this program—it is hard to cover them all. Some overarching lessons include:

- The importance of building on the existing knowledge and experience of experts in the field who are providing services or will be using the resource to ensure that the project in question meets the needs of the target audience. These experts are not limited to College fellows and staff, but generally are from a wide range of disciplines, from other medical specialists to consumer representatives.

- Although information can be disseminated easily via an article or a flowchart, to better understand and implement information, often more-targeted interaction is required: for example, audits, intervention workshops, and interactive online education modules, or such face-to-face interactions as a trainee sitting with a trainer to check reports against each other or the reporting guidelines and receiving feedback. All are methods that build improvement in the quality and safety of radiology.

The pie chart below details the type of patient involved in incidents.

![Pie chart showing types of patients involved in incidents](image)

Example of RaER acknowledgment screen containing summary statistics of recorded incidents

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**ARRS Publication Committee chair Ruth C. Carlos, University of Michigan Hospital; and Geoffrey B. Johnson, Mayo Clinic.**

Participants representing CSR were CSR president Xiaoyuan Feng, Hua Shan Hospital and Fu Dan University; Bin Lu, Fu Wai Cardiovascular Institute and Hospital; CSR vice secretary Bin Song, West China Hospital and Sichuan University; and Shenghong Ju, Zhong Da Hospital and Southeast University.

Observers included Thomas R. Goodman, Yale University School of Medicine; Christine Glastonbury, University of California–San Francisco; Charles E. Kahn, Jr., Medical College of Wisconsin; ARRS president-elect Jonathan S. Lewin, Johns Hopkins School of Medicine; ARRS president Melissa Rosado de Christenson, Saint Luke’s Hospital of Kansas City and University of Missouri–Kansas City; and Andrew B. Rosenkrantz, NYU Langone Medical Center.

**References:**