Notable advances have been made in stroke policy and outcomes research over the past year. Policy-relevant gray and published research is included in this review. The advances selected are organized under 3 areas: stroke policy and related evidence, predictive modeling, and quality improvement.

**Stroke Policy and Related Evidence**

**The Role of Evidence in Stroke Policy Investments**

Different types of evidence are required at each stage in the development and implementation of large scale stroke strategies. The role of evidence was examined in the development of the Ontario Stroke System (a $30 million per year health policy initiative to improve stroke care in Ontario, Canada). Researchers identified key stages in the implementation process and the various types of evidence mobilized at each stage. The value of this research for stroke knowledge translation and policy is that evidence can be systematically organized and shared strategically to achieve policy commitments.

**Strategies for Improving Stroke Care**

The Helsingborg Declaration 2006 on European Stroke Strategies is a consensus document with substantial potential for influencing stroke policy in Europe. The Declaration states that by 2015 all persons in Europe with stroke should have access to a continuum of care in the acute phase including rehabilitation and secondary prevention. Clear goals for improving outcomes, the means to achieve them, and evaluation are outlined. The document also calls for a system to be established to incorporate new research into stroke care.

In Canada, work continues on implementing the Canadian Stroke Strategy. The Canadian Stroke Network, a national center of excellence, has been a major contributor in developing research and knowledge translation toward improved policy and care. The policy challenge for Canada is that health is a provincial responsibility with substantially different health resources and commitments to stroke in each province. During 2007, several gains were made. For example, the Alberta Provincial Stroke Strategy was developed and a commitment of $1.1 million CDN was made to improve tele-stroke for remote areas. In addition, the Province of Ontario committed $5 million CDN for a Centre for Stroke Recovery.

The National Health Service in Britain developed a comprehensive consultation document on stroke to stimulate debate on how best to prevent and treat stroke. This document provides considerable detail about components of integrated care written in language that is understandable by policy-makers and the public. It provides useful frameworks that outline elements of care including poststroke care (see page 34), discussion questions, and stories that accompany the evidence-informed draft recommendations.

**Development and Implementation of Stroke Guidelines**

The generation and implementation of priority-setting guidelines for practice is an important step in operationalizing evidence. Sweden appears to be the first country to have developed a transparent, evidence-based mechanism to set priorities for stroke care. The guidelines consider need, effect size and evidence. The guidelines are presented in 2 versions: 1 for policy-makers and 1 for healthcare providers.

The need for stroke guidelines to include additional elements of care has been documented in a number of areas including emergency medical services and intensive care discharge. In addition, there has been a call to link national stroke policy more strategically to regional uptake. For instance, Lavados called for more specific details related to uptake at the regional level after an analysis of stroke incidence and service in Latin America and the Caribbean.

Research on guideline utilization indicates that having written policy and practice guidelines can improve compliance with best practice for therapeutic anticoagulation. Another study demonstrated the effectiveness of best practice utilization in poststroke depression.

**Access to, Need for, and Efficacy of Stroke Prevention and Treatment**

Advances have been made in identifying determinants of stroke burden and outcome such as stroke belt research and
other studies that examine regional, socioeconomic and ethnocultural variations in stroke prevalence and outcome. Stroke belt (areas of high incidence and mortality) analyses and other population health approaches to the epidemiology of stroke contribute to identifying where stroke-related policy should be directed. The stroke belt work suggests that early life exposures where one lives as a child are important in explaining stroke mortality. A study on urbanization and poverty levels suggests a relation between inner city slums and stroke.

Are those who need care getting it, especially those in low socioeconomic groups? A WHO study found that 87% of the 5.7 million people who die annually from stroke live in low or middle income countries. These people are often unable to access stroke units or new drugs. Primary prevention and adequate stroke treatment are essential. Following a study to quantify the socioeconomic gap in long-term health outcomes after stroke and related healthcare utilization, it was concluded that greater clarity is needed in policy decisions about access, eg, coordinated care investments and disadvantaged groups.

A study by Feigin, for example, provides increased understanding about stroke program and policy needs in the Maori and Pacific peoples.

Components of Integrated Care
Stroke units were found to be important in the prevention of complications. A systematic review of comparative stroke outcomes indicated that the benefits of stroke units in routine care were comparable to that seen in clinical trials. A study of weekday versus weekend mortality suggested that mortality increases over the weekend in both rural and urban hospitals in Canada. It was recommended that policy relating to specialists and weekend coverage be reviewed. Improvements to access to imaging facilities for stroke patients were recommended from an imaging service study in Scotland.

A study of stroke units in 886 hospitals in 25 European countries provided valuable insights into the current status of acute care. Less than 10% of hospitals had optimal facilities and in 40% the minimal level of service was not available. Access to stroke care units in public hospitals in Australia was compared with 1999 levels. Findings showed that although progress had been made, the percentage of people accessing stroke units was approximately 20% as compared with 70% in Sweden. Policy to improve access to stroke units was recommended.

Poststroke Outcome and Rehabilitation
Research has pointed to the need for greater attention to poststroke outcome and its determinants with studies showing high observed death and readmission. These authors call for more stroke-related health services research to clarify determinants of long-term stroke outcomes and to systematically evaluate targeted interventions in this area. Although there have been major advances in acute care for stroke in the Province of Ontario, deficiencies were reported in poststroke services such as depression. Correspondingly, a rehabilitation consensus conference was held in Canada. Priority areas for programs and research were identified including multimodal programs for reintegration, rehabilitation for severe stroke, cognitive rehabilitation, and research on the timing and intensity for 2 areas: aphasia therapy and therapy after mild to moderate stroke events. Posthospital care was the theme of a study of 7 hospitals in Taipei. These authors argue that our aging society must establish improved stroke service as a healthcare priority.

Prevention and Public Health
The first systematic review of articles on public education and policy for stroke prevention was published. The review examined stroke documents published since 1999. Using evaluation criteria and a data abstraction instrument, only 4 evidence-based policy articles on prevention were identified: 2 on prevention guidelines and 2 on recommendations for changes in health systems. Several studies published over the past year examined the effectiveness of intervention research on early warning signs of stroke, which contain implications for how this preventive measure might be improved. Also, there has been some important work on cultural considerations in treatment-seeking that has policy implications related to interaction between patients and providers.

Predictive Modeling
Accurate estimates of the burden of the target problem coupled with the likely outcome of policy options are valuable contributors to stroke policy decision-making. These estimates involve collecting, synthesizing, and communicating complex data. Thus, predictive modeling has considerable potential for influencing stroke policy. We found 3 notable articles published this past year that used predictive modeling related to stroke policy. In the first article, economic predictive modeling was used to demonstrate the “invest to save” approach in building an economic argument for funding public health prevention to reduce cardiovascular disease risk. In the second article, a multivariate risk prediction equation using the Duke Stroke Model was developed to estimate stroke admissions and financial impact. The resultant simulation model was used to produce a legislative document reporting on the potential health and economic impact of improved stroke services in Mississippi. The style of the report appears to be understandable at the policy level, and the approach used to communicate these data may be of value to other jurisdictions aiming to identify optimal investments in stroke. In the third article predictive modeling was used to examine the potential effectiveness of combining multiple interventions in secondary prevention of stroke. It was shown that at least 80% of recurrent cerebrovascular events might be prevented by incorporating 5 proven clinical strategies: dietary modification, exercise, aspirin, a statin, and a hypertensive agent. Additional therapies such as smoking cessation increase effectiveness.

Quality Improvement
Quality improvement in care based on a policy agenda requires changed individual and group behaviors. Clarifying barriers and facilitators to change is a key element of this process, although some conditions are context specific. A mixed methods approach was used to examine readiness for...
quality improvement from the perspectives of staff, patients,
and administrators in acute care.41 Factors influencing
the climate of change included the nature of past efforts to use
evidence in organizational change, working environment,
team climate and organizational stability. The data informed
the development of an implementation strategy. This ap-
proach may be of value to stroke health systems examining
the climate for change and working to improve it. In addition,
a review was conducted to determine organizational barriers
to the delivery of thrombolysis.42

Examples of practical methods for health system quality
improvement are important to policy-makers, administrators
and clinicians. A framework and collaborative process was
developed by LaBresh for diagnosing barriers to acute stroke
care, system redesign, implementation, and outcome assess-
ment. Several tools (eg, GWGT-Stroke) to support system change
were developed through this project.43 In another
article, stroke was used to illustrate the importance of linking
healthcare policy to education policy. Academic and medical
training must include methods for translation of research into
clinical delivery.44

The examples of policy-relevant research on stroke given
above demonstrate the breadth of research questions and
approaches being used to understand and act on stroke. This
work has yielded policy-relevant outcomes, as well as outputs
such as new research approaches related to stroke strategies
and elements of care, optimizing policy investments in stroke,
and knowledge translation. Despite the data on stroke morta-
ality and morbidity that compels policy-makers to act, clarity
about effective solutions and policy-maker roles in these
solutions is needed. In particular, how can we focus research
and policy on prevention and treatment of underserved people
and regions? Given data on the heavy burden of cardiovas-
cular disease in developing countries, how can evidence be
used to make the case that it receive greater attention in global
health?45 Lastly, in order to advance the quality of care and
improve outcome, how can policy include commitments to
research as a key component of stroke strategies?221

Disclosures

None.

References

1. Cameron JI, Rappolt S, Lewis M, Lyons R, Warner G, Silver F. Devel-
opment and implementation of the Ontario stroke system: The use of
3. Canadian Stroke Network and the Heart and Stroke Foundation of
Canada. Canadian Stroke Strategy. Canadian Best Practice Recommendations
for Stroke Care, Ottawa, 2006.
Available at: www.strokestrategy.ab.ca.
million in new centre for stroke recovery: Heart and Stroke foundation’s
new centre will battle stroke disability – the first of its kind in the world.
HeartStroke062606.asp.
Available at: www.dh.gov.uk/Stroke.
38:2037.
F, Wester PO, Ashpland K. Beyond conventional stroke guidelines: Setting
9. Acker JE, Pancioli AM, Crocco TJ, Eckstein MK, Jauch EC, Larrabee H,
Meltzer NM, Megendahl WC, Munn JW, Prentiss SM, Sand C, Saver JL,
Eigel B, Gilpin BR, Schoeberl M, Solis P, Bailey JR, Horton KB, Stranne
SK. Implementation strategies for emergency medical services within
stroke systems of care. A policy statement from the Am Heart Associa-
tion/Am Stroke Association expert panel on emergency medical services
10. Kahn JM, Angus DC. Health policy and future planning for survivors of
A, Sacks C, Jadue L, Salinas R. Stroke epidemiology, prevention, and
management strategies at a regional level: Latin America and the
12. Fis AM, Kim JH, Jaw JM, Trohan RG, Stephan EA. A written policy
increases compliance with guidelines for therapeutic anticoagulation prior
to elective direct current cardioversion of atrial fibrillation. *J Cardiov-
MB. Knowledge translation experience of a regional stroke program in the
evaluation of best practice recommendations for poststroke depression.
ER. Conservation of resources theory and knowledge translation in health
systems. 2007, in prep.
15. Howard G, Labarthe DR, Hu J, Yoon S, Howard VJ. Regional differences
in African Americans’ high risk for stroke: The remarkable burden of stroke
16. Glymour MM, Avendano M, Berkman LF. Is the ‘Stroke belt’ worn from
17. El-Saed A, Kuller LH. Is the stroke belt worn from childhood: Current
Urbanization and stroke prevalence in Taiwan: Analysis of a nationwide
survey. *Journal of Urban Health: Bulletin of the New York Academy of
19. Strong K, Mathers C, Bonita R. Preventing stroke: Saving lives around
20. van den Bos GAM, Smits JP, Westert GP, van Straten A. Socioeconomic
variations in the course of stroke: Unequal health outcomes, equal care? *J
Epidemiol Community Health*. 2002;56:943–948.
21. Feigin VL, McNaughton H, Dyll C. Burden of stroke in Maori and Pacific
people of New Zealand. *International Journal of Stroke*. 2007;2:
22. Govan L, Langhorne P, Weir C. Does the prevention of complications
explain the survival benefit of organised inpatient (stroke unit) care? *Stroke.*
23. Seenan P, Long M, Langhorne P. Stroke units in their natural habitat:
access to imaging facilities for stroke patients in Scotland. *Health Place*
26. Leys D, Ringelstein EB, Kaste M, Hacke W. Facilities available in
care units in Australian public hospitals: Facts and temporal progress.
28. Bravata D, Shih-Yieh H, Meehan T, Brass L, Concato J. Readmission and
death after hospitalization for acute ischemic stroke: 5-year follow-up in
30. Bayley MT, Hurdowar A, Teassell R, Wood-Dauphinee S, Korner-
Bitseny N, Richards C, Harrison M, Jutai JW. Priorities for stroke rehabilitation
and research: Results of a 2003 Canadian Stroke Network consensus conference.
31. Chiang KY, Wu YT, Ma AHS. Post-hospital care of stroke patients in Tai-


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