Putting Heart into Protecting the Brain: Comprehensive Cardiac Rehabilitation for Chronic Vascular Disease Management and Secondary Prevention after TIA or Mild Non-Disabling Stroke

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Background

Strokes account for 15,000-20,000 hospital admissions annually in Ontario, and with annual recurrence rates ranging from 4-14% secondary prevention is a priority. 1-3 A transient ischemic attack (TIA) is a stroke-like event which resolves in fewer than 24 hours.1

Cerebrovascular and coronary artery disease (CAD) share important commonalities with respect to pathophysiology and outcomes. Individuals presenting with a TIA or mild non-disabling stroke frequently have atherosclerosis throughout the vascular system, or co-morbid cardiovascular disease, and are at high risk for a recurrent stroke or cardiovascular event.2,4-7 Coronary artery disease, and ischemic TIA or stroke, also share many modifiable vascular risk factors, including physical inactivity, hypertension, abnormal blood lipids, tobacco use, obesity or overweight, diabetes mellitus, stress and depression.2,8-15

Not surprisingly then, current evidence-based guidelines for secondary prevention following stroke or TIA, acute coronary syndrome, and cardiac rehabilitation (CR) overlap substantially.16-18 A review of secondary prevention meta-analyses concluded that at least four fifths of recurrent vascular events among cerebrovascular patients could be prevented through a comprehensive multi-factorial strategy including pharmacological and behavioural interventions.19

Comprehensive cardiac rehabilitation is often available to heart patients following a cardiac event. Cerebrovascular patients could potentially benefit from an integrated multifactorial approach, and there may be compelling scientific, clinical and economic reasons to consider CR as a secondary prevention strategy after TIA/mild stroke. Indeed, one previous study of patients who had sustained a completed stroke 1-12 years earlier, showed improved risk factors and psychological status after comprehensive CR.20 To our knowledge, however, there has been no investigation of CR relatively early after TIA or mild non-disabling stroke. We hypothesized that a comprehensive CR program, in collaboration with a stroke prevention clinic (SPC), could offer feasible and effective secondary prevention following TIA or mild stroke, without reduplication of infrastructure and expertise.

Description of Pilot Study Methods

In order to test the feasibility and effectiveness of a comprehensive CR program for secondary prevention in patients with TIA or mild stroke, a pre-post pilot study was conducted. Eligibility criteria included: ischemic TIA or mild non-disabling stroke within the previous 12 months, and presence of at least one vascular risk factor. From January 2005 – April 2006, consecutive consenting subjects were recruited from the patient population of the Urgent TIA Clinics of the SPC at London Health Sciences Centre (LHSC). Subjects received usual medical care as per the SPC. Usual care followed the Heart and Stroke Foundation of Canada’s Coordinated Stroke Strategy Best Practise Guidelines, and study participants and their family doctors received standard secondary prevention advice to adhere to risk factor targets, including exercise. Subjects were also enrolled in the University of Western Ontario & LHSC Cardiac Rehabilitation & Secondary Prevention Program, which integrates medical management with structured exercise, dietetic and psychological services (stress management, 1:1 treatment, smoking cessation), in a 6-month nurse case-managed framework. Standardized measurements were taken at program entry and exit with respect to aerobic capacity, blood lipids, blood pressure...
blood sugar, body mass index, waist circumference, tobacco use, depression, anxiety, and health-related quality of life. We also measured cognitive functioning using a brief neuropsychological battery.

**Pilot Study Results**

Overall, we obtained statistically and clinically significant improvements in exercise capacity, lipid profile, anthropometrics, psychological and quality of life scores, although not in blood pressure, in this mixed gender sample. Mortality risk, as calculated from the Duke Treadmill Score, decreased significantly. We observed significant improvements in performance of neuropsychological tests sensitive to psychomotor speed, verbal learning and memory, and oral-verbal fluency. Results of the pilot study were presented earlier this year at the World Congress on Stroke and are now being prepared for publication.

**Implications to Practice**

From this trial we conclude that comprehensive CR is both feasible and effective as a secondary prevention strategy after TIA/mild stroke. We effectively linked two disparate clinical services. We obtained clinically and statistically significant improvements in key vascular risk factors. While replication and control are required, we have also obtained interesting preliminary evidence that CR may improve neuropsychological outcomes after TIA or mild stroke, which potentially have important prognostic and functional implications.

We believe that this innovative project exemplifies key principles of Wagner’s Chronic Disease Model. The SPC and the Cardiac Rehabilitation & Secondary Prevention Program at LHSC successfully collaborated to provide comprehensive, integrated vascular chronic disease care and prevention. This required delivery system re-design, which enabled us to transcend disease silos, effect interprofessional coordination between clinical services, and support patient self-management. Healthcare providers enjoyed decision support through ready availability of evidence-based guidelines, which were also used to inform our evaluation strategy. Based on our experience with this trial, we have now integrated key risk factor targets and evidence-based medication recommendations for TIA/stroke into our electronic patient management system. This trial exploited community resources, as we held our exercise program at the local YMCA.

Our linkages with primary care took the form of intake and discharge summaries of patients’ progress with respect to risk factor targets, generated and populated by our electronic patient management system.

In our view, key success factors included: 1) dedicated inter-service coordination and monthly meetings of SPC and Cardiac Rehabilitation & Secondary Prevention Program staff and investigators; 2) a systematic, formalized referral process; 3) a rigorous measurement and evaluation strategy, integrated from the outset with the program design; and 4) systematic real-time surveillance of patients’ progress toward evidence-based therapeutic targets, and of practitioners’ adherence to current, evidence-based guidelines.

**Research in Progress**

On the foundation of this feasibility and effectiveness trial, we are now conducting a two-site randomized controlled trial with our collaborators at the University of Ottawa Heart Institute (Drs. Neville Suskin & Robert Reid, co-PIs at London & Ottawa, respectively), funded by the Heart & Stroke Foundation of Canada. In this trial we randomly assign subjects to receive either usual care as delivered by the SPCs at either site, or to usual care + 6-month comprehensive CR, similar to the intervention delivered in the feasibility and effectiveness study.

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**References**

Heart Disease and Stroke: Can we Bridge the Divide? – A Case Illustration

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There are between 40,000 to 50,000 strokes in Canada each year. 1 Up to 75% of stroke patients have a history of heart disease. 2 Stroke and heart disease; particularly coronary artery disease (CAD), share many of the same underlying pathophysiological mechanisms. Almost all known risk factors are common to both conditions. These include hypertension, smoking, hyperlipidemia, diabetes, obesity, physical inactivity, and stress. 2 Underlying heart disease, such as atrial fibrillation, cardiomyopathy, or valvular heart disease, can result in cardioembolism which accounts for up to 15% of all strokes.