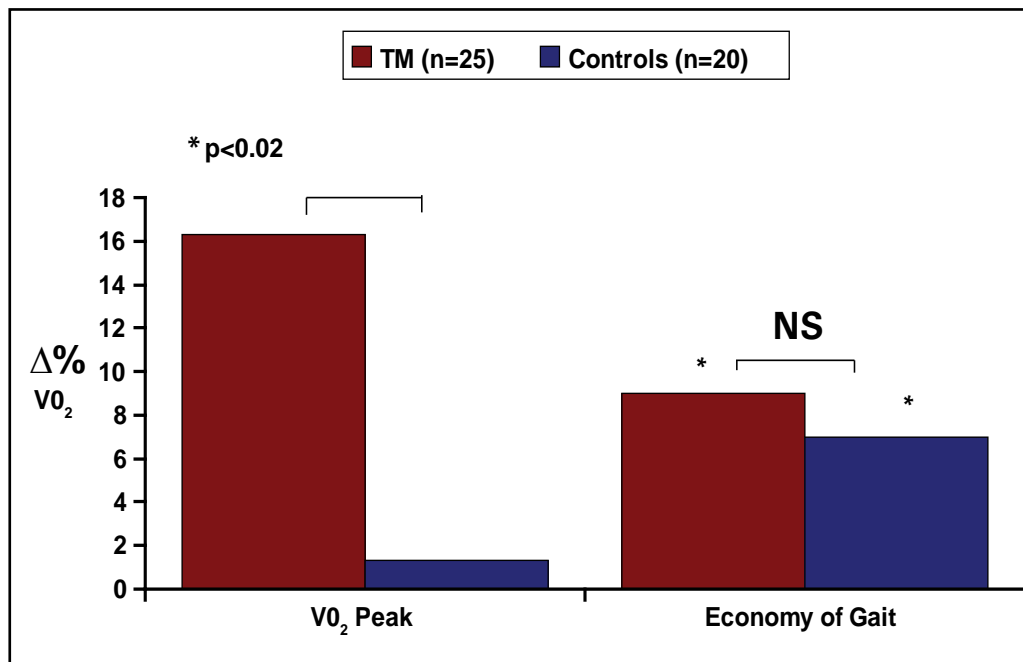


Getting Beyond the Plateau: Promoting Recovery in the Chronic Phase of Stroke

Contrary to accepted wisdom, improvement in physical activity for stroke patients does not peak 11 weeks after being discharged from the hospital. Richard F. Macko, MD, University of Maryland School of Medicine, Baltimore, MD, presented data that detailed an exercise program that continues to improve fitness, walking, insulin sensitivity, and glucose metabolism in what he described as the chronic phase of stroke treatment.

Community-based ambulatory activity profiles for patients in the chronic phase of hemiparetic stroke revealed that survivors demonstrated extremely low step counts and almost no step activity at high intensity (less than 3 minutes a day; Figure 1). The mean VO_2 peak was associated with profound aerobic deconditioning and severe fatigue [Michael K. & Macko RF. *Topics Stroke Rehabil* 2007].

Figure 1. RESULTS: Effects of Treadmill Training on Fitness and Economy of Gait in Chronic Stroke.



In addition to inactivity, patients who survive stroke are predisposed to insulin resistance and glucose intolerance [Vermeer SE et al. *Stroke* 2006]. These risk factors can be amended with treadmill exercise training, which has been shown to reduce insulin resistance, improve glucose tolerance, and prevent diabetes in this patient group [Ivey FM et al. *Stroke* 2007].

The benefits of treadmill training (TM) were further examined in a 6-month progressive task-repetitive TM program in stroke patients with long-term mobility impairment. TM significantly improved ($p<0.05$) treadmill-walking velocity by 51% and cardiovascular fitness by 18% ($p<0.05$) compared with control subjects who were not in the program. Exercise-mediated improvements in walking velocity correlated with increased activation in the cerebellum and midbrain, the areas of the brain that are associated with motor activity [Ivey FM et al. *Stroke* 2007]. Higher-intensity levels of exercise produced better outcomes.

Highlights from the



American Heart Association | American Stroke Association

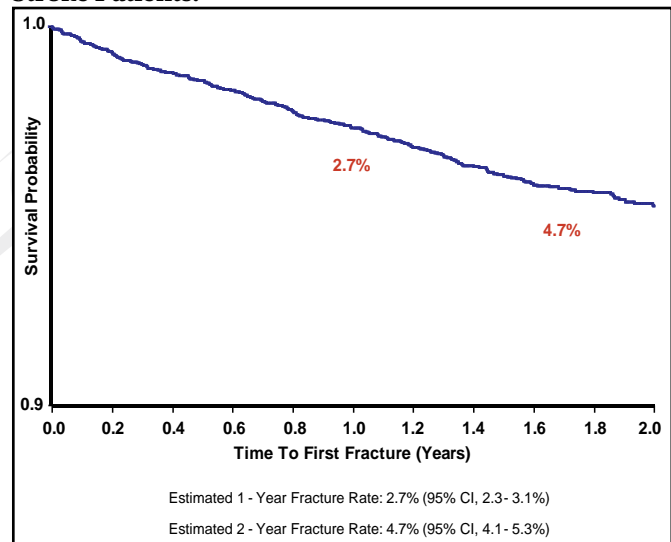
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A comprehensive program that deals with the multiple aspects of chronic stroke recovery, including rehabilitation, transition, and community aspects, can improve cardiovascular function and endurance in survivors. Data indicate that patients who are released from postacute stroke rehabilitation programs experience impaired ambulation, decreased cardiovascular function, injuries from falls, and limited social participation. One study estimated that the 2-year fracture rates were 4.7% (95% CI, 4.1 to 5.3) for newly released stroke patients (Figure 2). Intermediate functional impairment conferred a higher fracture risk than mild or severe functional impairment [Whitson HE et al. *J Am Geriatr Soc* 2006].

Figure 2. 2-Year Fracture Rates for Newly Released Stroke Patients.



Almost 50% of the community-dwelling stroke population needed full-time and able-bodied caregivers at home. A large proportion of these patients also reported depression, a lack of meaningful activity, and worsening of function. Further, data suggest a number of secondary problems: fewer than 50% of individuals with stroke have their risk factors assessed, treated, or controlled; 90% of those who are evaluated as overweight at initial evaluation remain overweight; only 51% of individuals who are hypertensive have their blood pressure under control; smokers do not quit smoking; and few participate in an exercise program.

“Evidence exists that extended home-based rehabilitation programs and physiotherapy improve functional independence following stroke. We need to do a better job of enrolling more patients into these programs,” concluded Pamela W. Duncan, PhD, Duke University, Durham, NC.

Multimodality Management of Cerebral Arteriovenous Malformations

The presence of cerebral arteriovenous malformations (AVM) confers considerable risk of intracerebral hemorrhage (ICH) and poor outcome. However, the best way to proceed in patients with unruptured AVMs, or whether to intervene at all, is hotly debated. William L. Young, MD, University of California, San Francisco, CA, reviewed 2 models for decision-making.

The decision of whether to treat should be based on a comparison of the estimated lifetime risk of harm without treatment, primarily from spontaneous hemorrhage, with the risks of interventional treatment. A common comparison is to cite an average annual risk of hemorrhage from an untreated AVM in the range of 2.4% to 4% per year. The risk is highest during the first 5 years after diagnosis and then decreases [Hernesniemi JA et al. *Neurosurgery* 2008; Kim H et al. *Stroke* 2007]. If the treatment risk is ~5%, there is quite a favorable risk benefit for intervention. However, actual risk for either approach is dependent on individual patient variables. In the case of surgical resection, for example, it is lesion size, any deep drainage and eloquence. Most (~71%) of the attributable risk of spontaneous hemorrhage after diagnosis can be accounted for by hemorrhagic AVM at presentation, deep AVM location, or exclusively deep venous drainage, according to one recent large study [Stapf C. et al. *Neurology* 2006]. This study pointed out that nearly half of patients are at low risk (~1% per year) hemorrhage rate.

“Functional outcome, rather than hemorrhage rate, is the meaningful endpoint,” said Dr. Young. Using this assessment model for the cohort expected to bleed at 1% per year, he estimated the risk of serious morbidity as 0.4% per year for best medical management [van Beijnum J et al. *Brain* 2009]. If this natural history risk is weighed against more realistic estimates of interventional treatment complication rates, (ie, 5% to 15%), a much more conservative management approach would be warranted. Dr. Young recommends prospective studies that compare best medical management with an interventional treatment approach. Rational risk assessment requires knowing the model assumptions, patient risk factors, and whether functional outcome versus hemorrhage is the endpoint, he said. Further, he pointed out that the pace of biomedical discovery and innovation is tremendous; “best medical therapy” might be more constructively viewed as “deferred