The Importance of Stroke Units

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Stroke Units Improve Patient Outcomes

Stroke is the fourth leading cause of death and a leading cause of disability in the United States.[1] Over the past two decades advances in the acute treatment of stroke using thrombolytics has improved patient outcomes. Progress has also occurred in secondary stroke prevention including additional antiplatelet agents, improved blood pressure control, statin use, better treatment of atrial fibrillation, and management of carotid stenosis. A recent study found that nearly two-thirds of Medicare patients who had a stroke died or were rehospitalized within one year.[2] Stroke units have been adopted by many centers for the treatment of acute stroke. This review will examine the science behind the stroke unit and its organization.

The role of the stroke unit

The ideal organization of hospital stroke care for risk factor evaluation and rehabilitation has been debated as far back as the 1950s.[3] Historically, the debate centered on whether patients with strokes were best served in a dedicated stroke unit compared to a general medical ward. More recently, trials have compared more versus less organized stroke services. The stroke unit is defined as including specialized personnel caring for stroke patients in a discrete ward. Conceptually, the model for this plan is similar to that of a coronary care unit which is widely accepted as the standard for care of patients with coronary artery disease. Under this general definition, an intensive model of an acute stroke unit would include continuous monitoring, high level of nursing care with possible life support services. The semi-intensive model would be similar but lacking life support, whereas non-intensive would have none of these resources. Additionally, there are rehabilitation stroke units that accept patients after an initial delay of about a week and comprehensive stroke units that combine both acute and rehabilitation stroke care.[4]

Initial studies from the 1970s suggested that intensive care unit management of stroke patients might not be beneficial.[3] However, since the 1980s, multiple trials have found significant benefits to an organized stroke unit to concentrate resources with associated quality and cost effectiveness.[5] It is believed that nurses who are specially trained in stroke care can better monitor and educate patients. Moreover, rehabilitation services like speech, physical, and occupational therapy would be concentrated and specialized to assist with the care of this unique population. Finally, social workers or case managers who arrange the post hospital care from stroke units are more experienced in coordinating appropriate community resources.[4]

The impact of stroke units

A comprehensive review of the literature regarding the impact of stroke units has found an overall benefit. A Cochrane meta-analysis of 31 trials found a reduced odds of death at a median of one year [odds ratio (OR) 0.86 (CI 0.76-0.98, P = 0.02)].[4] The benefit was even stronger if institutionalization (OR 0.82 CI 0.73 – 0.92, P = 0.0006) or dependency (0.82 CI 0.73 - 0.92, P = 0.001) were the measured outcomes. These 31 trials comprised 6939 subjects; 16 of the 31 studies compared stroke wards with general medical wards, four compared mobile stroke teams with medical wards, six compared mixed rehabilitation wards with medical wards, while the remaining compared stroke wards against mixed rehabilitation (five trials), comprehensive treatments wards (two trials), and mobile stroke teams (one trial). Sixteen trials were randomized and ten were blinded to final outcome. The final odds ratios did not change when trials were excluded because they lacked proper randomization, were not blinded, or did not have a pre-fixed interval outcome time for final analysis. The benefit of stroke unit assignment continues for at least five (three trials) and ten years (two trials).

Since the Cochrane report, the benefit of stroke units continues to be further validated. An Australian multi-center observational study of 17,659 admissions for ischemic stroke found a significant decrease in mortality (13.8% to 10.5%, p <0.001), increase of discharges to home (38.8% to 44.5%), and decrease in discharges to nursing homes (6.3% to 4.9%).[6] These differences remained statistically significant after controlling for demographics and indicators for a poor prognosis. Additional evidence that support stroke units versus general medical wards comes from a Canadian study of 3,631 patients. The authors found the thirty day mortality was 10.2% versus 14.8% (P<0.0001) with a number needed to treat of twenty-two.[7]

Since the 1990s studies have begun comparing more organized discrete stroke wards with less organized stroke services like a mixed rehabilitation ward or mobile stroke team. The Cochrane review concluded that a patient in a stroke ward was more likely to survive the acute hospitalization and return home living independently.[4] However, the strength of comparing alternative stroke services is based on only eight trials, therefore definitive conclusions are lacking. Further studies that are randomized, blinded and include long term follow-up are needed to determine what type of acute stroke ward organization yields the best patient outcomes and at what cost.

Length of stay

There is a modest reduction in the length of stay when comparing stroke unit care to an alternative organizational structure. Data was available from twenty-six trials for the Cochrane review, but was limited by heterogeneity of how hospital stay was calculated. Therefore instead of directly combining trial data the authors used a random-effects model of statistical analysis. They concluded that stroke units reduced time of stay by an equivalent of four days (range two to six).[4] An additional Canadian study published after the Cochrane meta-analysis evaluated one center's experience and found the average length of stay in a stroke unit was 15 days versus 19 days in a general ward. The odds that stroke patient would stay in hospital

greater than seven days was reduced by 30% (p<0.0001).[8] There have been no such studies in the United States.

Cost effectiveness analysis

The cost effectiveness of stroke unit care is uncertain. The few studies that have addressed this topic were conducted in a nationalized health care system and are difficult to translate to the United States. One report from England suggested that a home primary care model would be more cost effective until the quality-adjusted life-year reached about 60,000 pounds.[9] However, other studies have found stroke units are cost effective.[10,11] The cost advantage described in some investigations is attributable to reduced complications from stroke such as aspirations, shorter lengths of stay, decreased risk of recurrent strokes, decreased mortality, and better functional outcome.[10-12] A study in France found the difference between general wards and a stroke unit was 1,359 euros per year of life gained without disability.[11] A recent report compared a strategy of combining stroke unit with early home care versus stroke unit alone and found a positive cost effectiveness due to years of life saved.[13] The majority of the cost for a stroke unit is the initial investment of infrastructure. Also the operating costs are dependent upon the level of services provided, such as the number of nurses, rehabilitation specialists, and specialty equipment used for monitoring or rehabilitation.

Do all strokes need the same level of care?

Another area of uncertainty is whether all stroke patients' benefit from a stroke unit or just the more severely affected. A randomized study found that stroke units only benefited those patients with large vessel infarcts compared to those with small vessel lacunar infarcts who were treated with a mobile stroke service in a medical ward. The study found that small vessel stroke patients treated in a stroke unit had increased length of stay and more resources were used.[14] The Cochrane review conducted a subgroup analysis that showed no significant reduction of mortality in mild stroke patients (OR 0.92; CI 0.64-1.32; P < 0.05), but did conclude that they reduced risk of dependency (OR 0.75; CI 0.58-0.96; P = 0.02).[4] Therefore, further investigations are needed to help determine whether various stroke subtypes should be treated in different hospital units to maximize resources and overall outcomes.

Conclusion

Stroke units, defined as discrete locations within a hospital that provide coordinated care involving therapists, nurses, social workers, and neurologists with supportive technologies, has significant benefit to patient outcomes. These benefits include reduced mortality and morbidity, and improved functional independence. The issue of stroke units will become even more important as the population ages.

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Disclosure of Financial Interest

Brian Silver, MD, has served as a consultant for Abbott Vascular and as a defense expert in medical malpractice cases of stroke.

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