

# Health economics of cerebrovascular disease

## Can we do better?

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In the face of an aging population, the already substantial burden of stroke will likely increase. Efforts to optimize service implementation and organization, as well as monitor health care costs, must complement the quest for better therapies to prevent and treat stroke.

In this issue of *Neurology*®, Buisman et al.<sup>1</sup> report on acute hospital costs relating to inpatient and outpatient care for patients with TIA and stroke presenting to Dutch hospitals during 2010. Key observations include the higher cost for inpatient than for outpatient care (\$3,173 vs \$754 for TIA and \$6,845 vs \$636 for stroke) and the importance of length of stay as the main driver of the higher inpatient cost, followed by cost of investigations. Furthermore, hospital length of stay for stroke patients has decreased over time as compared with data from prior publications (27–30 days in the 1990s<sup>2–4</sup> down to 8.8 days for stroke in the current study).

Given that hospital days are the main driver of cost, and hospital length of stay has decreased, the data indirectly suggest that acute hospital cost per patient has reduced over time. The authors propose that this reduction is a result of improved organization of stroke services and advances in stroke therapies such as thrombolysis. These factors undoubtedly contribute; however, we must be cautious about making assumptions about cost of stroke care based on the acute hospital event alone. Stroke often necessitates long-term management after hospital discharge. While the current study includes estimates of acute inpatient and some outpatient costs, it omits cost incurred from inpatient and outpatient rehabilitation, community services, or transitions in care, precluding estimates for total economic burden attributable to stroke.

In recent years, pressure to shorten hospital stays has led to earlier discharges and more intensive community care.<sup>5</sup> While postdischarge care, such as clinician home visits, may result in better outcomes, they incur additional cost. An exhaustive estimate of total cost related to stroke burden may not be possible based on the current study. However, novel insights

are provided that may have implications for day-to-day management of stroke patients, or at a minimum, suggest opportunities to improve current care strategies.

For example, if outpatient TIA management costs one-quarter of inpatient care, then should not the organization of available outpatient services be a priority to achieve rapid assessment and management and thereby reduce admissions? What does a TIA patient gain from sitting on a ward with 24/7 nursing for an average of 3.6 days given that the thrombolysis rate in these patients is miniscule?<sup>6</sup> Buisman et al.<sup>1</sup> found that investigations also contribute to overall costs, so any time spent in the hospital awaiting investigations will increase length of stay and cost. Yet they also found that only 3.3% of patients underwent carotid endarterectomy, which poses the question whether all TIA and stroke patients need to undergo carotid imaging. In fact, targeted carotid imaging, based on careful patient selection, has been associated with health care efficiency gains.<sup>7</sup> Buisman et al.<sup>1</sup> further found that length of stay was reduced when patients were admitted Monday through Thursday compared with Friday through Sunday. If weekend admissions lengthen hospital stays substantially, do we need to work toward 24/7 full staffing in all hospitals? Should TIA patients presenting on Friday start medical therapy and then return for further outpatient management on Monday rather than occupying a hospital bed all weekend?

The authors of the present study also looked at the interaction between patient demographics and treatment costs and found that inpatient stroke costs rose by \$32 per each additional patient year of age, suggesting a need to focus our efforts on optimizing care for the elderly with stroke. Perhaps early geriatric team input on elderly stroke patient admissions would be of value, as this strategy is beneficial in the treatment of other health conditions that affect older patients.<sup>8</sup>

Finally, the authors considered differences between types of hospitals and locations and found that fewer than 10% of patients were assessed at

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academic hospitals, but inpatient hospitalization costs associated with stroke care were generally higher in nonacademic hospitals. In part, this may be attributable to lesser availability and efficiency of care provided in nonacademic hospitals, suggesting opportunities to identify and apply strategies that are effective in larger, academic institutions. Differences in case mix may also contribute to this finding, but this requires further investigation. Resource allocations by hospital type may need to be reviewed and more studies are needed that include smaller hospitals to further add to the evidence base. At a minimum, academic clinicians could consider increasing their outreach to their nonacademic neighbors to offer support and innovation sharing.

Future research should expand to include rehabilitation, community, and transition of care-related costs. We need to continue to broaden our understanding of factors contributing to costs including variations across hospitals, patient characteristics, and different models of care and implement available evidence such as presented by Buisman et al. to ensure that we use our limited resources to the optimal benefit of our patients now and into the future.

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#### DISCLOSURE

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#### REFERENCES

1. Buisman LR, Tan SS, Nederkoorn PJ, Koudstaal PJ, Redekop WK. Hospital costs of ischemic stroke and TIA in the Netherlands. *Neurology* 2015;84:2208–2215.
2. Van Exel J, Koopmanschap MA, Van Wijngaarden JD, Scholte Op Reimer WJ. Costs of stroke and stroke services: determinants of patient costs and a comparison of costs of regular care and care organised in stroke services. *Cost Eff Resour Alloc* 2003;1:2.
3. van Straten A, van der Meulen JH, van den Bos GA, Limburg M. Length of hospital stay and discharge delays in stroke patients. *Stroke* 1997;28:137–140.
4. Bergman L, van der Meulen JH, Limburg M, Habbema JD. Costs of medical care after first-ever stroke in the Netherlands. *Stroke* 1995;26:1830–1836.
5. Stock GN, McDermott C. Operational and contextual drivers of hospital costs. *J Health Organ Manag* 2011;25:142–158.
6. Nguyen-Huynh MN, Johnston SC. Is hospitalization after TIA cost-effective on the basis of treatment with tPA? *Neurology* 2005;65:1799–1801.
7. Clulow T, Ranta A. An assessment of initiatives to improve access to carotid ultrasound. *Int J Stroke* 2010;5:43.
8. Conroy SP, Ansari K, Williams M, et al. A controlled evaluation of comprehensive geriatric assessment in the emergency department: the “emergency frailty unit”. *Age Ageing* 2014;43:109–114.