

INVITED EDITORIAL COMMENTARY

Long-Term Outcome and Economic Burden of Aneurysmal Subarachnoid Hemorrhage: Are we Only Seeing the Tip of the Iceberg?



Shane W. English^{1,2,3*}

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Aneurysmal subarachnoid hemorrhage (SAH) remains a devastating form of stroke that affects a particularly young and often otherwise healthy population. It is associated with significant morbidity and premature mortality with a typical hospitalization for survivors that is protracted and requires specialized care [1, 2]. SAH is a common neurological reason for intensive care unit admission [3], which itself is resource-intensive and a significant driver of hospital cost [4]. These collectively contribute to the substantial burden associated with this disease—similar in magnitude to the much more common ischemic stroke [1].

The incidence of and mortality from SAH varies geographically [5]. In North America, as in most developed countries, mortality remains about 35% (range 20–67%) [5, 6]. It is widely accepted that less than one third of afflicted patients make a full recovery [7] and 20% of survivors experience significant morbidity [8] and impacts on daily living. Although some cohorts appear to demonstrate a decline in case fatality over the preceding 2+ decades [5, 9], these studies are becoming dated and the findings have not been consistent [10]. In modern cohorts of “poor-” or “high-” grade SAH (commonly defined as Hunt and Hess or World Federation of Neurological Surgeons grade 4 or 5), mortality rates appear consistent but good functional neurologic recovery appears to be achieved in higher proportions of patients, a number greatly influenced by the inclusion or

exclusion of non-survivors [6, 11, 12]. Although mortality and functional outcome are most commonly reported at 3 months and 6–12 months, respectively [13], a growing number of studies are demonstrating recovery in some patients well past 12 months [14, 15]. Timing of outcome assessment is thus an important consideration in understanding outcome of survivors.

In this edition of Neurocritical Care, Seule et al. report on outcomes, return to work and costs associated with 150 survivors of SAH (42 high-grade, 108 low-grade) between January 2007 and August 2010. This is a retrospective analysis of prospectively collected data within a single center registry of SAH survivors. Their rich dataset includes long-term follow-up with associated outcomes, including return to work status collected at a median time of 2.7 years post-SAH. Although mortality is not specifically reported, it appears to be low in the population from which their sample was drawn (~16%); these patients were not included in any analysis. An additional 29 patients were not included because of loss to follow-up, no response or no consent. Of the 150 included survivors, they report an impressive 76% achieving a favorable recovery (Glasgow Outcome Scale extended [GOSe] 5–8). Favorable recovery was achieved in 52% of the high-grade survivors. A particularly interesting finding is that observed improvements by at least 1 level in the GOSe are reported in 7 and 22% of survivors at 4 and 5 years post-SAH, respectively. Despite the impressive ‘good’ recovery rate, of those employed prior to their SAH, only 62% returned to work, with only about a third making a full return to their previous job highlighting a potential limitation of dichotomizing a recovery scale like GOSe into simply ‘good’ or ‘poor’. Whether these return to work data constitute the same ‘good’ recovery in the

*Correspondence: senglish@ohri.ca

¹ Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, Canada

Full list of author information is available at the end of the article

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eyes of the survivor as suggested by the GOSe remains untold.

Seule et al. also report on health care costs—both direct (inpatient care) and indirect (productivity losses). They report an average cost per patient of €344,277, with 84% being from indirect costs. Not unsurprisingly, they found higher costs (~€100,000) associated with high-grade SAH and greater disability. These data shed an important light on the financial burden of this disease—that disproportionately affects those classically of working age. Little data exists on this with such long-term outcomes.

It is, however, important to consider a few potential limitations presented by these data. Only survivors were included and so the economic burden of a premature death is not accounted for. In a UK study reporting on cost and burden of disease, they found SAH was associated with a mean loss of 11.1 years of life expectancy [16]. Furthermore, national averages for hospital costs and wages were used to calculate direct and indirect costs, respectively, rather than individual patient data. As such, the costs are more of a reflection of hospital duration and time off work than a true understanding of the specific economic burden attributable to SAH over another disease entity. Fernando et al. found that SAH was associated with significantly greater cost per day of hospitalization than other forms of intracranial hemorrhage and non-neuro case-matched controls [17]. This isn't unexpected given the numerous interventions often undertaken on patients with SAH during their protracted acute phase that endures to the end of the delayed cerebral ischemia period. As the authors appropriately point out, the assumptions made when calculating indirect costs (e.g., survival to retirement age) may further bias the result. Although this could potentially bias the costs in either direction, it seems quite likely that both the direct and indirect costs calculations underestimate the true economic burden of SAH.

In summary, the paper by Seule et al. is an important addition to the literature and contributes to our understanding of the long-term outcomes of SAH patients. The burden, both personal and economic, faced by the survivor and society as a whole may still be underappreciated. Reproducing these results, with other study designs like a multi-center prospective long-term registry, may further clarify when best to measure functional outcome in survivors. Whether this is the best measure to define a 'good' or a 'poor' outcome from the perspective of the patient remains unknown. We are just in our infancy as it relates to our understanding of which outcomes matter most, and when, to patients with SAH and their families.

Author details

¹ Clinical Epidemiology Program, Ottawa Hospital Research Institute, Ottawa, Canada. ² Department of Medicine (Critical Care), University of Ottawa, Ottawa, Canada. ³ School of Epidemiology and Public Health, University of Ottawa, Ottawa, Canada.

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