INVITED COMMENTARY

Comment on “Clinical Characteristics and Outcomes of Children with Acute Catastrophic Brain Injury: A 13-Year Retrospective Cohort Study”

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In this issue of *Neurocritical Care*, LaRovere et al. (REF) describe long-term outcomes in a retrospective cohort of pediatric patients with acute catastrophic brain injury from a single center over 13 years [1]. All patients were admitted to a pediatric or cardiac intensive care unit, had a neurologic consultation, and were hospitalized for at least 14 days if they survived to hospital discharge. Patients were determined to have catastrophic brain injury if they had an acute neurologic injury (e.g., traumatic brain injury, cardiac arrest, stroke, status epilepticus) and died prior to hospital discharge or were alive with a Glasgow Coma Scale score less than 13 at discharge.

The first step in interpreting this study is to have a clear understanding of the studied cohort. Clinicians use the term “catastrophic brain injury” to describe severe and unrecoverable neurologic injury that is untreatable or persists despite intensive therapies. However, at what point after injury, and with what degree of confidence, can we determine whether a neurologic injury is catastrophic? In the era of neurocritical care, we use monitoring and therapeutics to bring patients from the edge of catastrophe to a journey of recovery. Therefore, acknowledging that recovery from neurologic injury is a slow and moving target, we must balance the timing and the certainty of using such a term.

Acknowledging this nuance, the authors standardized their definition of catastrophic brain injury on the basis of the patient’s discharge level of consciousness and the duration of hospitalization to account for the severity and duration of the neurologic dysfunction. As the authors note, “Catastrophic brain injury is thus a condition based on a patient’s ultimate outcome (death or prolonged disorder of consciousness) rather than one based on features of their injury [1].” Although a Glasgow Coma Scale score of less than 13 was used as part of the definition of catastrophic brain injury in this cohort, it lacks the sophistication to delineate neurologic functional status. This definition is critically important as one reads this article, understanding that the intent was not to predict outcome on admission but rather to understand the patient during their hospitalization and after discharge.

The authors studied a discrete population, with only 106 of the more than 5500 patients meeting their inclusion criteria. In this severely injured cohort, only 14% survived to hospital discharge, with a median of 45 days of hospitalization. Notably, on admission, survivors and nonsurvivors were indistinguishable on the basis of functional status scale and pupillary reactivity.

The study defined catastrophic brain injury with the goal of describing the most severely neurologically injured patients and their long-term outcomes. At a median of 3 years post injury, 87% of survivors were still alive. Astonishingly, 30% were technology independent, 60% had regained normal alertness and responsiveness, and 75% had an improvement in their functional status score. These data are part of a small and growing body of work that highlights long-term recovery in patients who

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See related article doi: <https://doi.org/10.1007/s12028-021-01408-9>

were thought to be moribund on discharge. This recovery trajectory should intrigue us as to how we can look at acute hospitalization features to identify the possibility of delayed recovery. Furthermore, we should consider how we can refine this definition of catastrophic brain injury to be more accurate when it comes to long-term recovery.

15% were declared brain dead, almost three quarters of those who died were withdrawn from technologic support, highlighting the complexity of these patients. Unfortunately, data were not available as to why the withdrawal of life sustaining therapies occurred for most, but one wonders how we can thwart the self-fulfilling prophecy and identify those with perceived poor outcome from catastrophic brain injury who could have had long-term improvement.

So, when is brain injury deemed catastrophic? Hospital admission? Hospital discharge? Years down the road? LaRovere and colleagues highlight this challenge [1]. Catastrophic brain injury is a loaded term, and we should be cautious about labeling patients as such because it impacts the care we provide, the communication among staff, the discussions with families, and prognostication.

We are in the infancy of understanding recovery from acute neurologic injury. What we presume is catastrophic at discharge may be anything but that years down the road. Multidisciplinary approaches to prognostication are critical, and further research to delineate the features of who can recover is sorely needed.

Source of Support

This work received no funding.

Conflicts of interest

The author declares that there is no conflict of interest.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Received: 12 December 2021 Accepted: 14 December 2021

Published: 24 January 2022

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