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Response to Letter to the Editor Regarding: Intracranial Hypertension and Cerebral Hypoperfusion in Children with Severe Traumatic Brain Injury: Thresholds and Burden in Accidental and Abusive Insults

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We thank Dr. Ganesan for the thoughtful comments (1) regarding our recent publication in the journal (2). For the most part, we agree that there is likely loss of information when using hourly recordings of intracranial pressure (ICP) and cerebral perfusion pressure (CPP), although our work does suggest that these thresholds can lead to important information regarding the overall outcomes of children with severe TBI. As Dr. Ganesan is undoubtedly aware, the current evidenced-based guidelines for managing children with severe traumatic brain injury support treatment of ICP at a threshold of 20 mm Hg and age-based thresholds for CPP – both as level III recommendations that may be considered (3). Within each chapter of the guideline related to these topics, 11 manuscripts are listed in the evidentiary table – all of which used retrospective data collection to compile ICP and CPP data with the highest degree of granularity at the hourly level as we did. For these reasons, we believe that our manuscript fits well within the literature and adds further to the data regarding ICP and CPP thresholds for children at this time.

As for Dr. Ganesan's suggestion that a “pressure-time” variable for these important physiological parameters may be more informative, a few groups have explored this possibility. In addition to the study cited in adults with severe TBI (4), Chambers and colleagues developed a “Pressure Time Index (PTI)” for ICP and CPP in children in an attempt to evaluate the duration and severity of the pathophysiological derangements. Using 1-minute time intervals, the PTI for CPP was highly predictive of mortality and outcomes

(dichotomized GOS scores) in 81 children, while ICP did not demonstrate such a relationship (5). Young and colleagues recently published their experience with the Pressure reactivity index (PRx) and ‘Optimal CPP’ (CPPopt) in 12 children after severe TBI (6). This series was not sufficiently powered to determine if these continuous data collection and analyses could predict outcomes, but advocates of this approach believe that these techniques can have some utility in caring for children.

In our view, the opinion that minute-to-minute measurements of ICP and CPP are a more informative marker of cerebral health remains a still unproven hypothesis. We can envision that many characteristics of subjects – including age, gender, severity of injury (both GCS and other measures), neuroimaging characteristics, mechanisms of injury, resuscitation events, secondary insults and others – may play a significant role in determining how ICP and CPP thresholds should be targeted for children with severe TBI. We believe that a comprehensive assessment that could account for such variables will be able to determine the utility of treating patients based on the number of minutes of ICP above a threshold (or CPP below another). At the conclusion of such a study, a more personalized approach to intracranial hypertension management could be envisioned which would be a revolutionary advance for the field.

We thank Dr. Ganesan for bringing up this important topic.

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