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Authors' Reply

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We thank Fante et al for their comments on our recently published article (1). As rightly pointed out by Fante et al, we did not observe a statistically significant association between hyponatremia and seizures or hospital mortality (2). This is counter to what has been previously published by others (3–5). There are several reasons that could explain this difference. We observed a lower frequency of convulsive seizures in patients with hyponatremia as compared to other studies and this association was not statistically significant when factoring in severity of hyponatremia. There are likely several reasons for this: 1) our study had fewer patients with severe and moderate hyponatremia and therefore we grouped them together for analysis and 2) our patient population included all patients in the intensive care unit with externalized ventriculostomy drains (EVDs), including but not limited to children with intracranial tumors. Patients with intracranial tumors encompassed only 32% of our study population. The lower prevalence of moderate or severe hyponatremia in our patient population may be attributable to the low usage of hyponatremic intravenous fluids. Belzer et al reported a 12% incidence of hyponatremia and approximately 1/3 of patients studied received hyponatremic intravenous fluids (5). A recent meta-analysis concluded that administration of hypotonic maintenance intravenous fluids increases the risk of hyponatremia when compared to isotonic intravenous fluid administration in children in both the intensive care and post-operative setting (6).

We agree with Fante et al that further study is needed. Retrospective observational studies are able to determine associations, but not causality and thus highlight questions for prospective studies. The discrepancies in the literature highlight the need for multicenter studies that can account for variation in practice, such as the choice of intravenous fluids, underlying patient conditions as a risk factor for hyponatremia, and in depth characterization of hyponatremia and dysnatremia. Monitoring for electrographic seizures would be helpful

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as subclinical seizures in ICU patients are common (7). Careful characterization of these prospective factors may help us answer the authors' question of "what disturbance could be the most important in determining mortality" and give us the knowledge to improve outcomes.

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