

## **Clinically-Based Improvement Project Focused on Reducing Risks Associated with Diabetes Insipidus, Syndrome of Inappropriate ADH, and Cerebral Salt Wasting in Paediatric Post-Neurosurgical and Traumatic Brain Injury Patients**

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**Abstract :** Background: Complex fluid balance abnormalities are well-established post-neurosurgery and traumatic brain injury (TBI). The triple-phase response requires fluid management strategies reactive to urine output and sodium homeostasis as patients shift between Diabetes Insipidus (DI) and Syndrome of Inappropriate ADH (SIADH). It was observed, at a tertiary paediatric center, a relatively high prevalence of the above complications within a cohort of paediatric post-neurosurgical and TBI patients. An audit of the clinical practice against set institutional guidelines was undertaken and analyzed to understand why this was occurring. Based on those results, new guidelines were developed with structured educational packages for the specialist teams involved. This was then re-audited, and the findings were compared. Methods: Two independent audits were conducted across two time periods, pre and post guideline change. Primary data was collected retrospectively, including both qualitative and quantitative data sets from the CQUIN neurosurgical database and electronic medical records. All paediatric patients post posterior fossa (PFT) or supratentorial surgery or with a TBI were included. A literature review of evidence-based practice, initial audit data, and stakeholder feedback was used to develop new clinical guidelines and nursing standard operation procedures. Compliance against these newly developed guidelines was re-assessed and a thematic, trend-based analysis of the two sets of results was conducted. Results: Audit-1 January2017-June2018, n=80; Audit-2 January2020-June2021, n=30 (reduced operative capacity due to COVID-19 pandemic). Overall, improvements in the monitoring of both fluid balance and electrolyte trends were demonstrated; 51% vs. 77% and 78% vs. 94%, respectively. The number of clear fluid management plans documented postoperatively also increased (odds ratio of 4), leading to earlier recognition and management of evolving fluid-balance abnormalities. The local paediatric endocrine team was involved in the care of all complex cases and notified sooner for those considered to be developing DI or SIADH (14% to 35%). However, significant Na fluctuations (>12mmol in 24 hours) remained similar - 5 vs six patients - found to be due to complex pituitary hypothalamic pathology - and the recommended adaptive fluid management strategy was still not always used. Qualitative data regarding useability and understanding of fluid-balance abnormalities and the revised guidelines were obtained from health professionals via surveys and discussion in the specialist teams providing care. The feedback highlighted the new guidelines provided a more consistent approach to the post-operative care of these patients and was a better platform for communication amongst the different specialist teams involved. The potential limitation to our study would be the small sample size on which to conduct formal analyses; however, this reflects the population that we were investigating, which we cannot control. Conclusion: The revised clinical guidelines, based on audited data, evidence-based literature review and stakeholder consultations, have demonstrated an improvement in understanding of the neuro-endocrine complications that are possible, as well as increased compliance to post-operative monitoring of fluid balance and electrolytes in this cohort of patients. Emphasis has been placed on preventative rather than treatment of DI and SIADH. Consequently, this has positively impacted patient safety for the center and highlighted the importance of educational awareness and multi-disciplinary team working.

**Keywords :** post-operative, fluid-balance management, neuro-endocrine complications, paediatric

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