EDITORIAL COMMENTARY

Quest for a Whimsical Prescient Tool!

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The architecture of human brain is complex and is the most vital organ which is the centre of cognition, skill, behavior and intelligence. Critical illness creates a havoc in the entire human system appalling the brain by altering the cerebral microcirculation, revoking the blood brain barrier, depriving of its nutrition and distorting the homeostasis [1]. It is a formidable task to accurately measure the catastrophic events and furthermore onerous to predict it. Earlier, the goal of critical care was to prevent mortality; as the mortality reduction was achieved there was notable rise in morbidity. The quest for morbidity prevention set the dawn of third revolution of medical care which is the quality care. Morbidity is an intermediate state between life and death caused by the same pathophysiological process that are related to death with an enormous scope for research.

The neurological insult that happens during the course of critical illness in a child greatly hampers the development of neuro-cognitive and adaptive behavior. The physiological state of a critically-ill child at presentation and early Pediatric Intensive Care Unit (PICU) course determines the morbidity risk. Acute encephalopathy is reported in 70% of patients with sepsis [1]. There is 2.8% risk of morbidity in severe sepsis, 20% risk in children with congenital heart disease and those who undergo cardiac surgery [2]. Nonconvulsive seizures are seen in 30% and delirium measured by Cornell Assessment of Pediatric Delirium (CAPD) score occurs in ~20% of critically-ill children [3]. In the National Health Services (NHS) annual report from UK, 11% of 60,000 PICU admissions from 2017 to 2018 suffered some form of neurologic morbidity [4]. Neurological dysfunction during critical illness is measured using clinical examination skills, electro-encephalography, near infra-red spectroscopy, intra-cranial pressure, optic nerve sheath, neuroimaging and biomarkers.

The prediction tools are instruments that heed to mortality and morbidity of a critically-ill child. The indicators of neurological outcome were scored by Dr. Debra Henry Fiser who pioneered the development of the Pediatric Overall Performance Category (POPC) and Pediatric Cerebral Performance Category (PCPC) scales to assess the quality of care in critically-ill children [5]. Subsequently on further exploration in this avenue by Dr. Murray M Pollack, who has developed Functional Status Scale (FSS) and compared it with the standard behavior assessment scales to validate FSS in critically-ill children [6]. Prediction scores such as Pediatric Risk of Mortality (PRISM)-3, Pediatric Index of Mortality (PIM)-2 and 3 help us to predict mortality rather than morbidity of a critically-ill child at admission and during early PICU stay. Outcome scores such as POPC, PCPC, FSS, Functional independent measure for Children (WeeFIM), Pediatric Evaluation of Disability Inventory, etc. are developed to assess the neurological and functional status of critically-ill children at and after discharge from PICU. Gupta et al. integrated both and developed a novel tool to predict the favourable neurological outcome at admission and during early PICU stay among children with critical illness using 20 risk factors which had an area under the curve (AUC) of 0.90 [7]. The study by Bhadani et al. published in IJP, studied the external validation of this tool in a prospective observational study consisting of 163 critically-ill children, which had an AUC of 0.72 (0.64–0.80) at admission to PICU and 0.99 (0.99 to 1.00) at discharge [8]. There are caveats in this tool as important factors of neurological outcome such as dysglycemia, electrolyte disturbances, delirium and level of consciousness have not been included. The outcome prediction at admission is borderline with an AUC of 0.72 however, it has shown enthralling results at discharge that need extensive external validation and bootstrapping.

Child's brain is in a dynamic state and the stress of critical illness might disrupt the development leading to life-long incapacitation. Hence, as critical care physicians we should be diligent in identifying high risk patients, prepare the family and prevent the child from escalating into grave morbidities. PODIUM consensus conference overemphasized the

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need of continuous neuromonitoring and delirium assessment in critically-ill child with multi-organ dysfunction syndrome (MODS) to prevent neurological failure [3]. Whatever might be the cause of PICU admission, brain centered approach should be the practise to prevent morbidity and we are desperately in need of an effective morbidity prediction tool at admission to think and plan ahead of time.

Declarations

Conflict of Interest None.

References

1. Smith M, Meyfroidt G. Critical illness: The brain is always in the line of fire. Intensive Care Med. 2017;43:870–3.
2. Brown KL, Agrawal S, Kirschen MP, et al. The brain in pediatric critical care: Unique aspects of assessment, monitoring, investigations, and follow-up. Intensive Care Med. 2022;48:535–47.
3. Schlapbach LJ, Weiss SL, Bembea MM, et al. Scoring systems for organ dysfunction and multiple organ dysfunction: The PODIUM consensus conference. Pediatrics. 2022;149:S23–31.
4. Ref-209-PICANet2020_AnnualReportSummary_v1.0.pdf [Internet]. Available at: https://www.hqip.org.uk/wp-content/uploads/2021/02/Ref-209-PICANet2020_AnnualReportSummary_v1.0.pdf. Accessed on 22 Oct 2023.
5. Fiser DH. Assessing the outcome of pediatric intensive care. J Pediatr. 1992;121:68–74.
6. Pollack MM, Holubkov R, Glass P, et al. The functional status score (FSS): A new pediatric outcome measure. Pediatrics. 2009;124:e18–28.
7. Gupta P, Rettiganti M, Gossett JM, Daufeldt J, Rice TB, Wetzel RC. Development and validation of an empiric tool to predict favorable neurologic outcomes among PICU patients. Crit Care Med. 2018;46:108–15.
8. Bhadani KH, Sankar J, Datta SK, et al. Validation of a clinical tool to predict neurological outcomes in critically ill children-a prospective observational study. Indian J Pediatr. 2023. https://doi.org/10.1007/s12098-023-04482-3.