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## Local implementation and standardization of the Pediatric Severe Traumatic Brain Injury Guidelines

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**Local implementation  
and standardization of the Pediatric Severe Traumatic Brain Injury Guidelines**

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**Medical Student**

**Resident/Psychology Intern**

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**Primary Mentor (one name only):** Jessica S. Wallisch, MD

**Other authors/contributors involved in project:** Sarah Brunner, MD; Ariel Gilbert, RN; Tara Benton, MD; Kelly Tieves, DO, MS

**IRB Number (if applicable):** STUDY00001131

**Describe role of Submitting/Presenting Trainee in this project (limit 150 words):**

Through guidance of Dr Wallisch and Dr Brunner, this resident's participation in this QI study consisted of drafting the IRB exemption submission form, creating data collection instructions, performing chart review, data entry into REDCap, exporting data for run chart analysis, and submitting findings to local and national conferences.

**Problem Statement/Question, Background/Project Intent (Aim Statement), Methods (include PDSA cycles), Results, Conclusions limited to 500 words**

**Problem Statement/Question:**

Severe pediatric Traumatic Brain Injury (TBI) remains a significant cause of morbidity and mortality. Evidence-based guidelines leave gaps in how to best implement and deliver standardized care on the local hospital level.

**Background/Project Intent (Aim Statement):**

We aim to improve clinical outcomes for severe TBI patients (Glasgow Coma Scale  $\leq 8$ ) with standardization of care according to updated evidence-based guidelines. We will target early guideline adherence (initial 72 hours of PICU admission) with a focus on 1) targeted temperature management (TTM  $< 38.0$  C), 2) avoidance of hyperventilation (PaCO<sub>2</sub>  $< 30$ mmHg), 3) initiation of early enteral nutrition, and 4) maintenance of cerebral perfusion pressure (CPP  $> 40$ mmHg).

## **Methods (include PDSA cycles):**

The Children's Mercy Hospital Pediatric ICU Severe TBI Guidelines were updated after the 3<sup>rd</sup> edition of the Brain Trauma Foundation Pediatric Severe TBI Guidelines. The first PDSA cycle consisted of educational curriculum including multidisciplinary lectures, bedside algorithms and bedside audits for real-time education and process improvement. The second PDSA cycle focused on improving temperature management. Updated ordersets included earlier provider notifications, proper Blanketrol set up, and scheduled Tylenol for 72hrs. Chart review compared guideline adherence from baseline (June 2018-May 2019) to post-implementation (Oct 2019-September 2020) for the four clinical indicators.

Patients were identified through electronic medical record and CMH trauma database. During chart review, all patients with severe TBI were included for TTM. Patients without evidence of herniation (presence of bradycardia and hypertension, pupillary changes, or emergent repeat head imaging) were included in avoidance of hyperventilation. Patients with invasive ICP monitoring were included for CPP. Patients without contraindications for enteral nutrition (vasoactive medications, intraabdominal injury, undergoing anesthesia) were included in the nutrition assessment. Data was collected via Research Electronic Data Capture (REDCap) database and exported to Microsoft Excel for run chart analysis. Goal adherence was chosen from prior publication as TTM 80%, avoidance of hyperventilation 90%, nutrition 100%, and CPP 80%.

## **Results:**

Thirty-six severe TBI patients were identified and screened by two pediatric intensivists from June 2018 to September 2020. Run charts were plotted over time by quarter and included two PDSA cycles. Avoidance of hyperventilation had 16% baseline adherence with early evidence of a shift, suggesting improved adherence to PaCO<sub>2</sub> goals post-implementation (n=10 pre-implementation, n=9 post-implementation). Similarly, adherence to CPP goals gave early suggestion of a shift (n=8 with ICP monitors pre-implementation, n=17 post-implementation, baseline adherence 42%). Early enteral nutrition adherence (n=12 pre-implementation, n=16 post-implementation, 100% baseline adherence) remained at 100% post-implementation. TTM saw no appreciable shift or trend in data with variable adherence to guidelines (n=18 pre and post-implementation, 54% baseline adherence).

## **Conclusions:**

Education, bedside audits, and temperature management interventions were feasible implementation strategies that led to improvement of some guideline adherence indicators. Initiation of early nutrition maintained excellent adherence post-implementation. Avoidance of hyperventilation and maintenance of CPP showed appreciable early improvement in adherence post-implementation. TTM revealed variable adherence without marked improvement following implementation. PDSA cycle 3 will continue to target TTM with change to esophageal temperature monitoring probes with ongoing education on Blanketrol setup and use.