

## End-Tidal CO<sub>2</sub> Levels vs. Arterial CO<sub>2</sub> Levels in Children with TBI



For patients with Traumatic Brain Injury (TBI), the partial pressure of CO<sub>2</sub>, arterial (PaCO<sub>2</sub>) can be adjusted to help with the regulation of cerebral perfusion. However, this can prove difficult to carry out in children. The non-invasive method of capnography measures end-tidal CO<sub>2</sub> (EtCO<sub>2</sub>) and is often used for paediatric patients as an alternative to arterial cannulation.

EtCO<sub>2</sub> measurements have previously been used to predict PaCO<sub>2</sub> levels in adults but as such, no major clinical evidence is available to confirm or deny the accuracy of this method in paediatric patients with TBI. The Brain Trauma Foundation has published guidelines that recommend avoidance of prophylactic hyperventilation and PaCO<sub>2</sub> less than 30mm Hg in the initial 48 hours after submission. But there is no recommendation either for or against the use of EtCO<sub>2</sub>. This study was conducted to evaluate the validity of using EtCO<sub>2</sub> as an indicator of PaCO<sub>2</sub> in children and adolescents. Using secondary analysis, researchers explored the agreements of PaCO<sub>2</sub>-EtCO<sub>2</sub> measurements in 137 patients in the PICU.

Study findings show that less than 50% of the PaCO<sub>2</sub>-EtCO<sub>2</sub> pairs were in agreement, with only moderate correlation in the first 24 hours. Results suggest that PaCO<sub>2</sub>-EtCO<sub>2</sub> substitutions may be even more unreliable within the first 8 hours of admission, as the differences in PaCO<sub>2</sub>-EtCO<sub>2</sub> were largest during this period.

Findings also show that the presence of Paediatric Acute Respiratory Distress Syndrome (PARDS) in the first 24 hours of admission to the PICU was associated with a lower likelihood of PaCO<sub>2</sub>-EtCO<sub>2</sub> agreement. On average, PaCO<sub>2</sub> was 9.9mm Hg higher than its paired EtCO<sub>2</sub> value in patients who developed PARDS within the first 24 hours of admission. The median PaCO<sub>2</sub>-EtCO<sub>2</sub> differences were found to be higher overall with those that developed PARDS in the week after TBI, compared to those who did not develop PARDS. However, more research is needed for the use of PaCO<sub>2</sub>-EtCO<sub>2</sub> differences in indicating PARDS occurrence.

Based on these results, EtCO<sub>2</sub> should not be substituted for PaCO<sub>2</sub> measurements in paediatric patients. Researchers recommended that PaCO<sub>2</sub> should be used when monitoring CO<sub>2</sub> levels in the first 24 hours after TBI.

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Published on : Fri, 23 Aug 2019