

Adverse Prehospital Events and Outcomes After TBI



Traumatic brain injury (TBI) is a major global health issue, affecting approximately 70 million people annually. Severe TBI can lead to death or irreversible disability within hours. Emergency medical services (EMS) provide initial care guided by the Brain Trauma Foundation (BTF) guidelines, which focus on preventing secondary brain injury by managing hypoxia, hypotension, and hyperventilation. Despite these guidelines, prehospital occurrences of these conditions remain common. The Excellence in Prehospital Injury Care (EPIC) Study confirmed the importance of avoiding these complications.

A recent study conducted within the LITES Network examined the impact of prehospital hypoxia, hypotension, and hypocarbia on TBI outcomes. This study analysed data from eight Level I trauma centres and their affiliated EMS agencies in the LITES Network between January 2017 and June 2021. It included adult patients (≥ 18 years) with confirmed TBI (head AIS 1-6) and an ISS of at least 9, excluding interfacility transfers and those who received prehospital CPR. The study's primary outcomes were ED death, hospital death, and unfavourable discharge disposition.

The study analysed 14,994 patients (median age 47 years, 71% male, median head AIS 3). Adverse TBI events included hypoxia (12%), hypotension (10%), and hypocarbia (61% among those with advanced airway management). Outcomes showed 2% died in the ED, 12% died in the hospital, and 25% had an unfavourable discharge. Hypoxia (ARR 2.24), hypotension (ARR 2.05), and hypocarbia (ARR 7.99) significantly increased the risk of ED death, with all three also linked to higher hospital mortality and unfavourable discharge.

The study found that prehospital hypoxia, hypotension, and hypocarbia were independently linked to higher risks of death and disability in patients with confirmed TBI, even after adjusting for various factors. The risks were particularly high for patients with hypocarbia and those with a head AIS of 1 to 4. However, in more severe TBI, the associations with death and disability were less pronounced. These findings support the BTF prehospital care guidelines and highlight the importance of avoiding these conditions in TBI patients.

While the EPIC study implemented BTF guidelines and showed increased survival in severe TBI cases, this study underscores the harmful effects of prehospital hypoxia, hypotension, and hypocarbia. Notably, prehospital hypoxia and hypotension combined significantly increase mortality, reinforcing the need for aggressive prevention and treatment in the field. Hypoxia, while associated with poor outcomes, has a more nuanced effect.

The study suggests that avoidance of secondary brain injury through the correction of hypoxia and hypotension is crucial once the patient reaches the hospital. Ongoing research is necessary to better understand the impact of isolated versus sustained hypoxia and hypotension, and how early detection and correction during prehospital care can improve outcomes.

The study also highlights the negative effects of prehospital hypocarbia, which was associated with poor outcomes, particularly after advanced airway management. Future efforts should focus on preventing hypocarbia, especially in TBI patients, to improve prehospital care and outcomes.

Overall, these findings show that in patients with acute TBI, prehospital hypoxia, hypocarbia, and hypotension were linked to poor outcomes. Further research is needed to determine if these adverse events can be reversed and to better identify patients with suspected TBI who would benefit from the BTF prehospital care guidelines.

Source: [JAMA](#)

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