Duration of Coma Predicts Outcomes in Pediatric and Adolescent Traumatic Brain Injury

Luz de Luna Lawes[1], Meagan Kelly[1], Gerald Sibley[4], Lindsey Elliott[2], Scott Schultz[2], Ann Tilton[2], Jerome Volk[6], David C Yu[2,5], Jessica A Zagory[2,3]

LSU Health Sciences Center[1], Children's Hospital New Orleans[2], LSU Health Sciences Center Division of Pediatric Surgery, Department of Surgery[3], LSU Health Sciences Center, Division Of Physical Medicine And Rehabilitation[4], Tulane University School Of Medicine[5], LSU Health Sciences Center, Department Of Neurosurgery[6]

Introduction

- Traumatic brain injury (TBI) is one of the leading causes of pediatric morbidity and mortality in the United States (1).
- TBIs are typically classified as blunt or penetrating, with motor vehicle collisions and firearm use comprising majority of incidents (1).
- Previous studies have examined the significance of age at injury, rural-urban disparities, and pathophysiological changes to determine factors that may influence outcomes (2,3,4).
- The aim of our study is to evaluate the significance of duration of coma after TBI to predict possible self-care, mobility, and cognition outcomes.
- We hypothesize that there will be significant differences in length of coma and functional outcomes in pediatric and adolescent patients who suffered a TBI.

Methods

- A retrospective review of pediatric and adolescent trauma patients under 18 years old admitted to an accredited pediatric inpatient rehabilitation (IPR) unit after TBI between January 1, 2018, and December 31, 2023, was performed.
- Fisher's exact tests were performed to analyze relationships between demographics, mechanism of injury, initial condition using Glasgow Coma Scale (GCS), and functional ability at discharge.
- Functional ability was measured at IPR admission and discharge using Pediatric Functional Independence Measure (WeeFIM) scores.

Results

	Coma < 7 days (62)	Coma >/= 7 days (60)	P- value
Age (years)	8.5±5.7	8.9±5.8	0.3744
Sex (male)	45	41	0.6926
Race (N, white)	20	22	0.7038
Blunt force injury	52	48	0.6420
Initial GCS	7±3.6	4.5±1.8	<0.0001
Botulism required	14	26	0.0203

Table 1. Demographics of pediatric and adolescents TBI patients

	Coma < 7 days (62)	Coma >/= 7 days (60)	P- value
Hospital length of stay	15.2±10.7	38.2±29.0	<0.0001
WeeFIM self-care at discharge	34.1±16	24.1±15.5	0.00038
WeeFIM mobility at discharge	20.5±9.0	14.8±9.0	0.0001
WeeFIM cognition at discharge	19.1±9.7	14.7±8.9	0.005
IPR length of stay	27.2±20.1	47.7±25.7	<0.0001
Wheelchair needed at discharge	18	39	0.0001
Community reintegration	93%	76%	0.0204

Table 2. TBI outcomes after rehabilitation

Discussion

- 122 patients were included in the study; 62 patients endured a coma less than 7 days while 60 patients endured a coma 7 days or longer.
- There was no significant difference in age, sex, race, or mechanism of injury between groups (Table 1).
- Patients with long coma duration had a lower GCS at admission and required botulism for spasticity (Table 1).
- Patients with long coma duration also had longer hospital and IPR length of stay (Table 2).
- WeeFIM scores across all domains (self-care, mobility, and cognition) were significantly worse for patients with longer duration of coma at both IPR admission and discharge (Table 2).
- Long coma patients were more likely to require a wheelchair at discharge, and less likely to attain school/community reintegration (Table 2).

Conclusions

Duration of coma equal to or greater than 7 days after TBI predicts worse outcomes for pediatric and adolescent patients.

References

1. Peixia Cheng, Ruotong Li, David C. Schwebel, Motao Zhu, Guoqing Hu, Traumatic brain injury mortality among U.S. children and adolescents ages 0–19 years, 1999–2017, Journal of Safety Research, Volume 72, 2020, Pages 93-100, ISSN 0022-4375, https://doi.org/10.1016/j.jsr.2019.12.013.
2. Sarnaik, A., Ferguson, N. M., O'Meara, A. I., Agrawal, S., Deep, A., Buttram, S., Bell, M. J., Wisniewski, S. R., Luther, J. F., Hartman, A. L., & Vavilala, M. S. (2018). Age and mortality in pediatric severe traumatic brain injury: Results from an international study. Neurocritical Care, 28(3), 302–313. https://doi.org/10.1007/s12028-017-0480-x
3. Yue, J. K., Upadhyayula, P. S., Avalos, L. N., & Cage, T. A. (2020). Pediatric traumatic brain injury in the United States: Rural-urban disparities and considerations. Brain Sciences, 10(3), 135. https://doi.org/10.3390/brainsci10030135
4. Serpa, R. O., Ferguson, L., Larson, C., Bailard, J., Cooke, S., Greco, T., & Prins, M. L. (2021). Pathophysiology of pediatric traumatic brain injury. Frontiers in Neurology, 12. https://doi.org/10.3389/fneur.2021.696510