PREHOSPITAL EMERGENCY CARE
2023, VOL. 27, NO. 5, 507–538
https://doi.org/10.1080/10903127.2023.2187905

Taylor & Francis
Taylor & Francis Group

BRAIN TRAUMA FOUNDATION TBI GUIDELINES

Prehospital Guidelines for the Management of Traumatic Brain Injury – 3rd Edition

Al Lulla[a], Angela Lumba-Brown[b], Annette M. Totten[c], Patrick J. Maher[d], Neeraj Badjatia[e], Randy Bell[f], Christina T. J. Donayri[g], Mary E. Fallat[h], Gregory W. J. Hawryluk[i], Scott A. Goldberg[j], Halim M. A. Hennes[k], Steven P. Ignell[b], Jamshid Ghajar[l], Brian P. Krzyzaniak[m], E. Brooke Lerner[n], Daniel Nishijima[o], Charles Schleien[p], Stacy Shackelford[q], Erik Swartz[r], David W. Wright[s], Rachel Zhang[t], Andy Jagoda[d], and Bentley J. Bobrow[u]

[a]Department of Emergency Medicine, UT Southwestern Medical Center, Dallas, Texas; [b]Department of Emergency Medicine, Stanford University, Stanford, California; [c]Department of Medical Informatics and Clinical Epidemiology, Oregon Health & Science University, Portland, Oregon; [d]Department of Emergency Medicine, Icahn School of Medicine at Mount Sinai, New York, New York; [e]Department of Neurocritical Care, Neurology, Anesthesiology, Neurosurgery, University of Maryland School of Medicine, Baltimore, Maryland; [f]Uniformed Services University, Bethesda, Maryland; [g]Trauma Services, Queens Medical Center, Honolulu, Hawaii; [h]Hiram C. Polk Jr Department of Pediatric Surgery, University of Louisville, Norton Children's Hospital, Louisville, Kentucky; [i]Department of Neurosurgery, Cleveland Clinic and Akron General Hospital, Fairlawn, Ohio; [j]Department of Emergency Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts; [k]Department of Pediatric Emergency Medicine, UT Southwestern Medical Center, Dallas Children's Medical Center, Dallas, Texas; [l]Department of Neurosurgery, Stanford University, Stanford, California; [m]Menlo Park, California, United States; [n]Department of Emergency Medicine, Medical College of Wisconsin, Milwaukee, Wisconsin; [o]Department of Emergency Medicine, UC Davis, Sacramento, California; [p]Pediatric Critical Care, Cohen Children's Medical Center, Hofstra Northwell School of Medicine, Uniondale, New York; [q]Trauma and Critical Care, USAF Center for Sustainment of Trauma Readiness Skills, Seattle, Washington; [r]Department of Physical Therapy and Kinesiology, University of Massachusetts, Lowell, Massachusetts; [s]Department of Emergency Medicine, Emory University, Atlanta, Georgia; [t]University of Arizona College of Medicine-Phoenix, Phoenix, Arizona; [u]Department of Emergency Medicine, McGovern Medical School at The University of Texas Health Science Center at Houston (UTHealth), Houston, Texas

ARTICLE HISTORY
Received 19 December 2022; Revised 6 February 2023; Accepted 28 February 2023

Introduction

Worldwide, 69 million people sustain traumatic brain injury (TBI) annually (1). The incidence of TBI in low- and middle-income countries is three times greater than in high-income countries, with fatality rates ranging from as low as 5.2/100,000/year in France to as high as 80.73/100,000/year in South Africa (2).

TBIs may range from mild, including concussions, to severe, including coma and death. In general, a TBI is caused by a direct or indirect force to the brain that disrupts normal brain function (3). The vast majority of TBIs are mild, but distinguishing mild injury from more severe TBI in the prehospital setting may not be immediately apparent. Severe TBI is a leading cause of morbidity and mortality, resulting in 2.87 million TBI-related emergency department visits, hospitalizations, and deaths in the United States annually. Approximately one-third of these events occurred in children (3). The likelihood of moderate-severe TBI is heightened in any prehospital patient sustaining physical trauma with Glasgow Coma Scale (GCS) score <15, loss of consciousness, multisystem trauma requiring an advanced airway, or report of post-traumatic seizure (4).

The mortality rate associated with blunt traumatic injury is exponentially increased when associated with TBI. Death from severe TBI often occurs within the first few hours following injury. Prehospital and early management of the primary injury with prevention of secondary brain injury and avoidance of secondary iatrogenic brain insults are critical to maximizing outcomes. Secondary brain injury is a pathophysiologic injury to the brain resulting from related insults that follow the primary event including cerebral hypoperfusion and ischemia, increased intracranial pressure (ICP), metabolic dysregulation, hypoxia, and temperature instability.

In the United States, fatality rates for all causes of TBI are lower in metropolitan areas and increase progressively in more rural areas. These differences are significant both for unintentional and assault-related TBIs depicted in Figure 1 (3). Currently, the average fatality rate for TBI from all causes is 22% higher in rural versus urban America. Figure 2 illustrates this disparity (3). These findings strongly suggest that longer transport intervals and limited access to prehospital care may be implicated in higher rates of morbidity and mortality from TBI in these communities.

Emergency medical services (EMS) professionals are most often the first health care professionals to assess and treat a

CONTACT Al Lulla aditya.lulla@utsouthwestern.edu

Supplemental data for this article is available online at https://doi.org/10.1080/10903127.2023.2187905.