

CLINICAL MANAGEMENT OF TBI PATIENTS



ZOLL®

Traumatic Brain Injury (TBI) remains a significant issue in modern warfare, with frequent diagnoses in both combat and training environments.¹



As the primary injury cannot be undone, management strategies must focus on preventing secondary injuries.²

¹ Pazdan R, et al. Traumatic Brain Injury in the Military. Fundamentals of Military Medicine. Borden Institute-Office of the Surgeon General U.S. Army MedCoE. 2019, Chapter 38

² Vella, M. et al. Acute Management of Traumatic Brain Injury. Surgical Clinics of North America, 2017 Oct; 97(5): 1015-1030

WHAT IS PRIMARY AND SECONDARY BRAIN INJURY?

Primary brain injury refers to a sudden and profound injury to the brain that is considered to be more or less complete at the time of impact. This occurs at the time of an explosion, car accident, gunshot wound, fall, or other incident.



Secondary brain injury refers to the changes that evolve over a period of hours to days after the primary brain injury. It includes an entire cascade of cellular, chemical, tissue, or blood vessel changes in the brain that contribute to further destruction of brain tissue.

FACTS:

Patients often do not die as a consequence of the primary injury but rather due to secondary brain injury that occurs after the initial impact

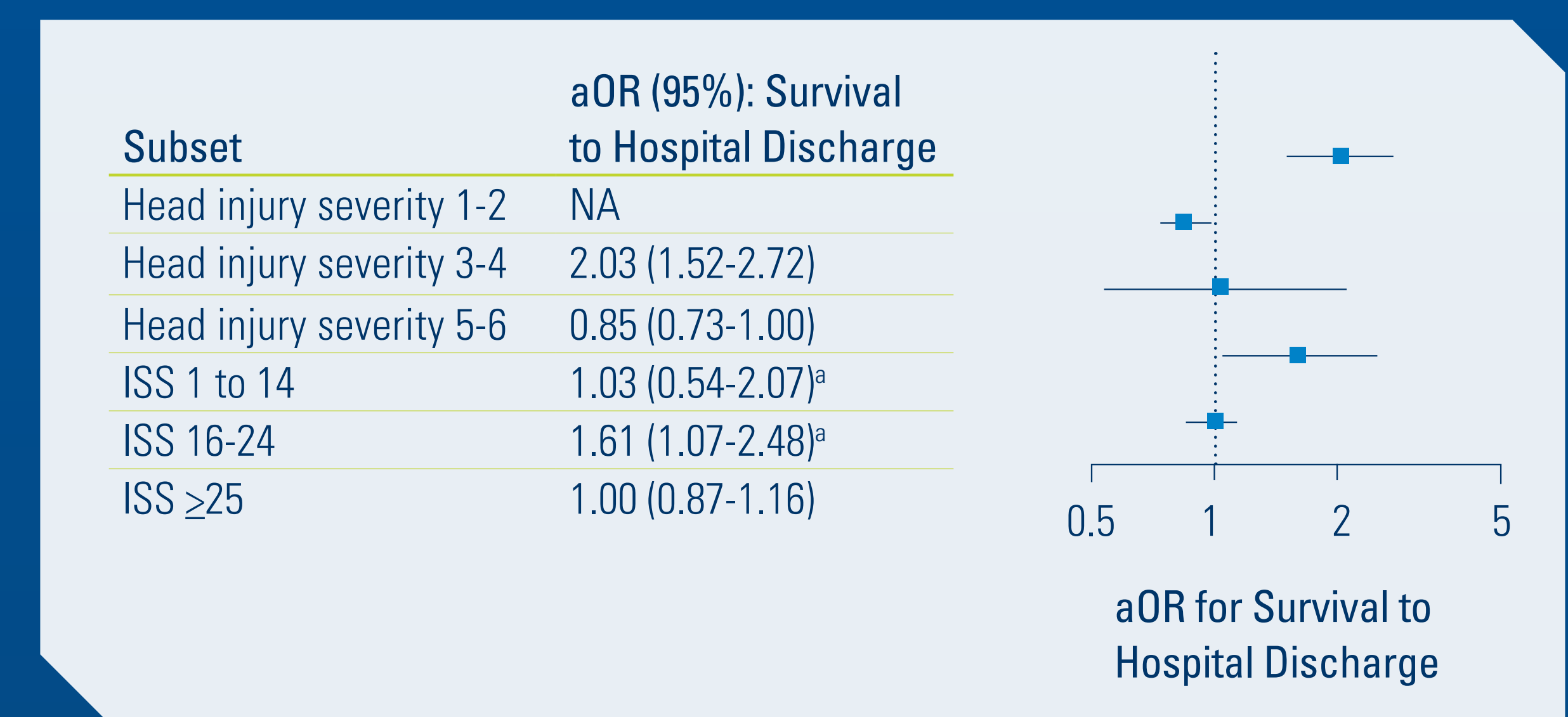


Of TBI patients who die,
50% do so within hours
of injury

LATEST EVIDENCE – EPIC-TBI STUDY

- Statewide (US) intention-to-treat using before/after design in patients with moderate to critically severe TBI
- Studied the impact of implementation of the prehospital TBI guidelines on patient outcomes
- Over 130 EMS agencies involved with 21,852 patients enrolled

The adjusted survival rate doubled among patients with severe TBI and tripled in the severe, intubated cohort. Furthermore, guideline implementation was significantly associated with survival to hospital admission.



These findings support the widespread implementation of the prehospital TBI treatment guidelines.

To help prevent secondary brain injury, TBI patients should avoid:

HYPOXIA

Hypoxia is associated with doubling odds of death⁵

HYPOTENSION

Single-episode hypotension (SBP<90 mmHg) is associated with doubling of mortality and dramatically increased risk with repeated episodes⁶

HYPERVENTILATION

Severe hyperventilation is associated with nearly threefold increase in odds of death⁷

⁵ McHugh G et al. Prognostic Value of Secondary Insults in Traumatic Brain Injury: Results from The IMPACT Study. *Journal of Neurotrauma*. 2007 Feb; 24(2)

⁶ Manley G et al. Hypotension, hypoxia, and head injury: frequency, duration and consequences. *Archives of Surgery*. 2001 Oct; 136 (10): 1118-1123

⁷ Davis D. et al. The Use of Quantitative End-Tidal Capnometry to Avoid Inadvertent Severe Hyperventilation in Patients With Head Injury After Paramedic Rapid Sequence Intubation. *The Journal of Trauma and Acute Care Surgery*. 2004 April; 56 (4): 808-814

As soon as the tactical situation allows and resources become available, follow the TCCC⁸ and ATLS⁹ principles of managing airway, breathing, and circulation.

FOCUS ON:

- Stopping uncontrolled bleeding (hemorrhage control)
- Maintaining Systolic BP > 90 mmHg
- Maintaining SpO₂ > 90%
- Maintaining CO₂ between 35 – 40 mmHg (do not hyperventilate)

⁸ Joint Trauma System/ Committee on Tactical Combat Casualty Care, TCC Guidelines 1 Aug 2019
⁹ American College of Surgeons. ATLS Advanced Trauma Life Support. 10th Edition, 2018



FROM POINT OF INJURY TO DEFINITIVE CARE

The ZOLL Propaq® M and Propaq MD support the management and treatment of TBI patients throughout the continuum of care:

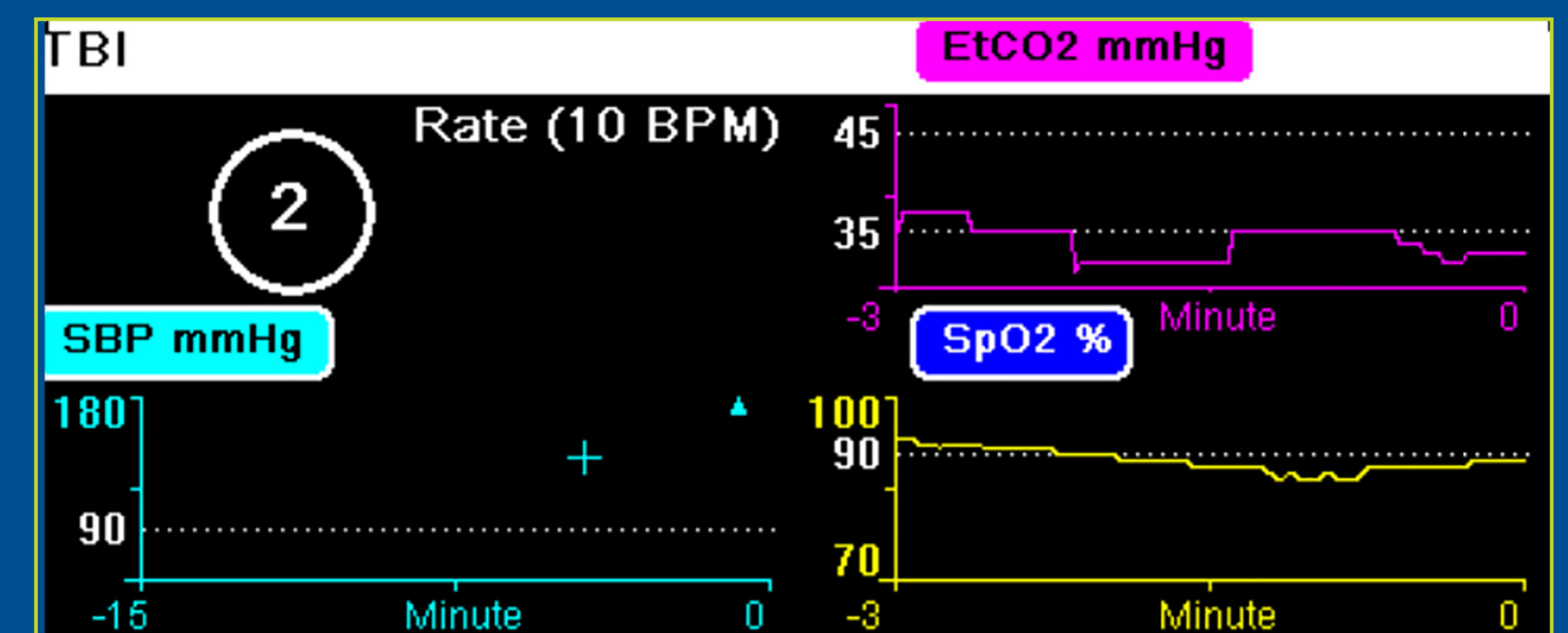
- Tactical Field Care
- Medical Evacuation
- Treatment in MTFs



ZOLL Propaq M and Propaq MD provide clinical decision support for managing TBI patients

The integrated TBI Dashboard™ provides **Monitoring and Trending Data** with a focus on preventing:

- Hypoxia
- Hypotension
- Hyperventilation

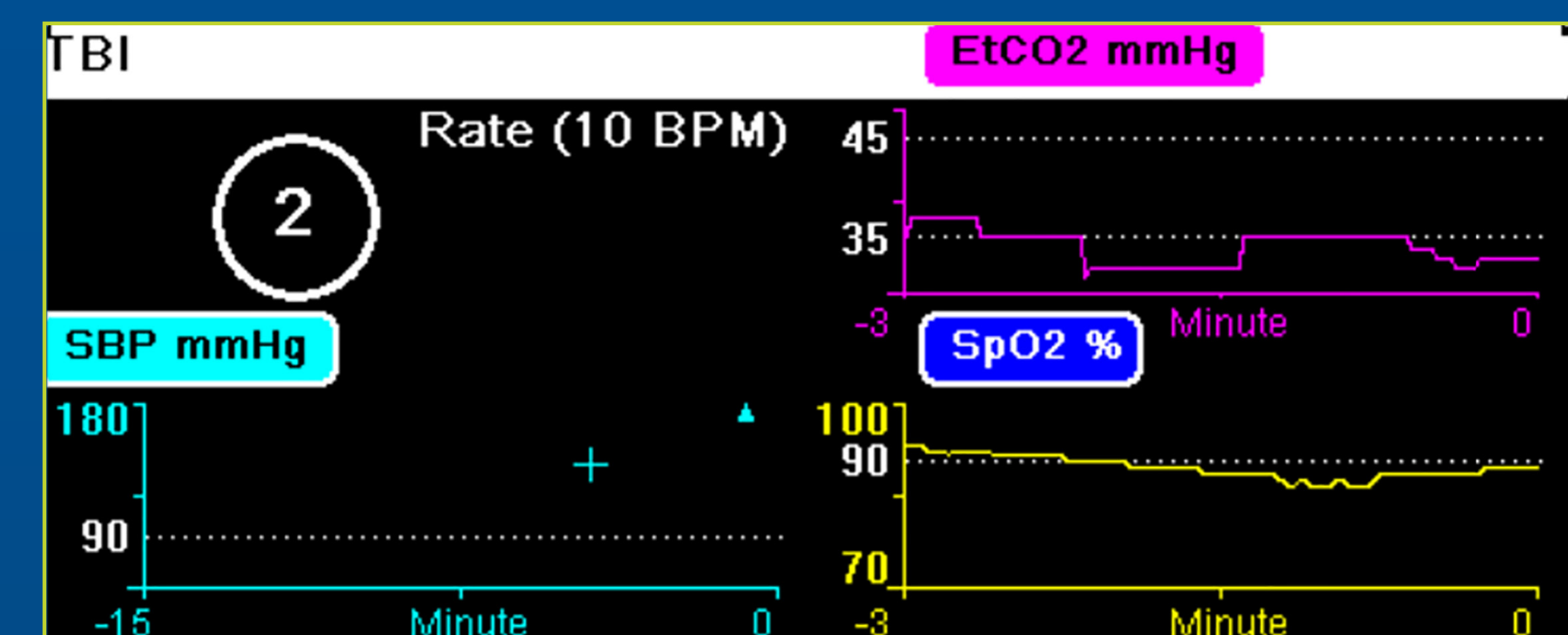


The TBI Dashboard provides crucial information for the management and treatment of TBI patients.

The TBI Dashboard enables patient care decisions to be made before a patient becomes critical.

It provides a comprehensive display of the most relevant physiologic data for monitoring hypotension, hypoxia, and hyperventilation — as recommended by the guidelines and proven by the EPIC study.

- Continuously updated data provide trending information of all relevant vital signs at a glance.
- The breath-by-breath countdown timer helps to maintain proper ventilation rates.
- The target values for each parameter remind medics of the targets per protocol.



For more information, visit <https://www.zoll.com/medical-markets/military/tbi>