

A Description of Characteristics and Outcomes for Injured Patients Receiving Prehospital Whole Blood Using a Statewide Linked EMS and Trauma Registry Dataset

AUTHORS

Jessica Rosner¹, Dalsy Banta¹, Remle P. Crowe², Edward C. Preusser², Antonio R. Fernandez²
1.Office of Emergency Medical Services, Virginia Department of Health, Glen Allen, Virginia, USA 2. ESO, Austin, Texas



INTRODUCTION

Traumatic injuries are responsible for approximately 4.4 million fatalities worldwide each year, representing almost 8% of all deaths (WHO, 2024).

About 30–40% of trauma mortality can be attributed to excessive blood loss, with 33–56% of hemorrhage-related deaths occurring in the prehospital setting (Tompeck, 2020; Kauvar, 2006).

Prehospital blood administration has been identified as a key factor in improving survival rates among patients suffering from trauma-induced hemorrhage (Levy, 2024; Kauvar, 2006).

OBJECTIVE

The objective of this study was to use a novel approach for linking emergency medical services (EMS) and trauma patient care records to evaluate demographic, injury, EMS response, and outcome data among Virginia prehospital trauma patients administered whole blood products by an EMS clinician.

METHODS

STUDY DESIGN

This was a retrospective observational study.

POPULATION & DATA SOURCE

All EMS events occurring between January 1, 2021 and December 31, 2024 submitted to the Virginia EMS State Data Repository, provided by ESO (Austin, TX), were evaluated.

Inclusion criteria were:

- 9-1-1 response,
- successful passage of state data validation,
- documentation of whole blood administration performed by an EMS clinician,
- a disposition consistent with patient treatment and transport, and
- documentation of a cause of injury within the EMS patient care record.

Records for patients transported by air medical services were excluded.

DATA LINKAGE

To link EMS incident data from the Virginia EMS Data Repository to patient outcome data from records submitted to the Virginia Statewide Trauma Registry, a masked patient ID was created using primary and secondary demographic fields (e.g., name, date of birth) weighted through the Levenshtein distance method. This statewide approach to data linkage had not previously been employed in the Commonwealth of Virginia.

ANALYSIS

Descriptive statistics were calculated.

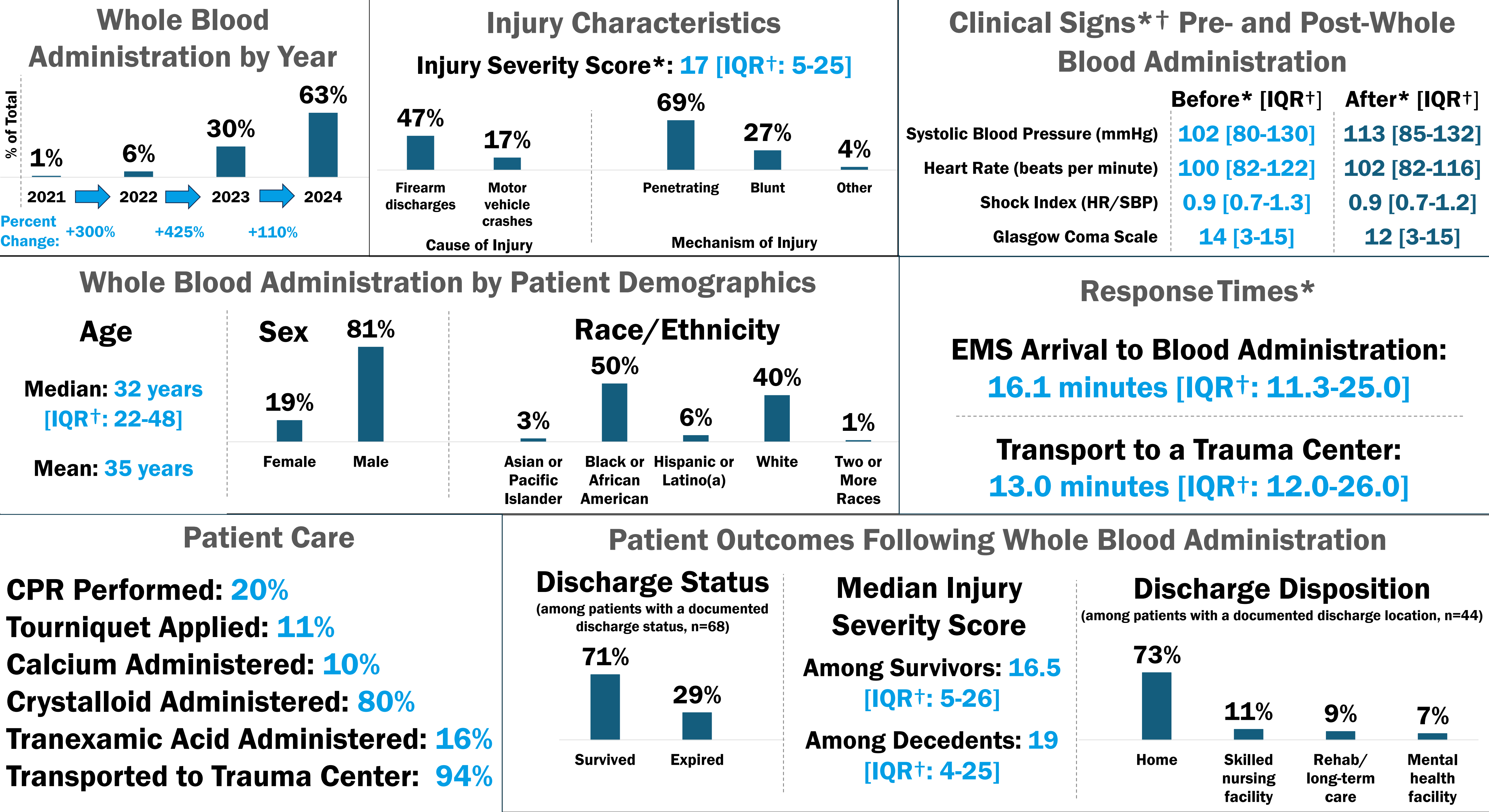
References

- Injuries and Violence. Geneva, Switzerland: World Health Organization (WHO); 2024. Accessed by OEMS Epidemiology Team 7 March 2025: <https://www.who.int/news-room/fact-sheets/detail/injuries-and-violence>
- Tompeck, A. J., Gajdhar, A. U. R., Dowling, M., Johnson, S. B., Barie, P. S., Winchell, R. J., et al. (2020). A comprehensive review of topical hemostatic agents: The good, the bad, and the novel. Journal of Trauma and Acute Care Surgery, 88(1), 1. doi:10.1097/ta.00000000000002508
- Kauvar, D. S., Lefering, R., & Wade, C. E. (2006). Impact of hemorrhage on trauma outcome: An overview of epidemiology, clinical presentations, and therapeutic considerations. Journal of Trauma: Injury, Infection & Critical Care, 60(6), 3. doi:10.1097/01.ta.0000199961.02677.19
- Levy, Matthew J., DO, MSc, Garfinkel, E. M., DO, May, Robert, EdD, NRP, Cohn, Eric, BS, NRP, Tillett, Z., MD, Wend, C., MD, et al. (2024). Implementation of a prehospital whole blood program: Lessons learned. Journal of the American College of Emergency Physicians Open, 5(2), e13142. doi:10.1002/emp2.13142

RESULTS

A total of 70 injured 9-1-1 patients transported by 10 ground EMS agencies met all inclusion criteria and no exclusion criteria during the four-year study period.

*Median values
†Interquartile Range



CONCLUSION

One in four patients administered whole blood had an EMS transport time of at least 26 minutes. Without EMS intervention, these patients would have experienced a critical time delay in blood administration, increasing the likelihood of an adverse outcome. Using a novel method for linking EMS and trauma patient care records, this study was able to determine that injured patients who received prehospital blood administration had a 69% survival rate. These findings can inform the development of prehospital blood programs that effectively balance patient need and responsible stewardship of limited resources (i.e., blood products). Importantly, EMS and trauma dataset linkage had never been conducted statewide in Virginia. This ground-breaking dataset linkage will facilitate further investigation into prehospital patient outcome data and patient movement throughout the trauma system, enabling advanced research efforts across the Commonwealth of Virginia.