Early Dried Plasma Transfusion for Traumatic Brain Injury with Concurrent Hemorrhage in a Resource-Constrained Civilian Setting

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BACKGROUND

- Traumatic brain injury (TBI) and hemorrhage are leading causes of trauma deaths.
- Patients with concomitant TBI and hemorrhage face a high risk of death.
- Plasma may mitigate coagulopathy, endotheliopathy and hypovolemia.
- FDP (Freeze-Dried Plasma) is advantageous in austere settings due to its extended shelf life, temperature-stable storage, and rapid reconstitution.
- Limited evidence exists on the survival impact of plasma in patients with concurrent TBI and hemorrhage.

OBJECTIVE

- To examine the association between early plasma transfusion and mortality in adult patients with TBI and concomitant hemorrhage.

METHODS

- Design: Secondary analysis of prospective adult trauma cohort study, "Epidemiology and Outcomes of Prolonged Trauma Care" (EpiC) from JAN 2022 – DEC 2025.
- Setting: 6 hospitals + 1 EMS agency in the Western Cape, South Africa.
- Inclusion Criteria: Age ≥18 with concurrent TBI and hemorrhage injuries from blunt or penetrating trauma; alive at initial contact with EpiC facility within 6 hrs of injury; at least one injury classified as moderate or severe.
- Analysis: Cox proportional hazards model adjusted for clinical covariates using inverse probability of treatment weighting.

TBI criteria: Head Abbreviated Injury Score (AIS) severity ≥2, AIS severity *ranges from 1 (minor) to 6 (non-survivable). TBI* severity classified using GCS and injury on CT brain.

TBI Severity	Mild	Moderate	Severe
Lowest GCS (in first 24 hours)	13 – 15	9 – 12	≤8
Injury seen on CT Brain	Normal CT	Intracranial hemorrhage, skull fracture, parenchymal injury	Diffuse axonal injury, >5mm shift, herniation

Hemorrhage criteria: extracranial injury AIS score of ≥1 and at least one physiologic criterion.

Hemorrhage Severity	Mild	Moderate	Severe
Criteria	SBP >90, SI 0.7–<1.2	SBP 70–90, SI 1.2–<1.6	SBP ≤70, SI ≥1.6, lactate ≥10, large blood product volume

SBP, systolic blood pressure; SI, shock index.

OVERALL COHORT CHARACTERISTICS

696 Patients Included

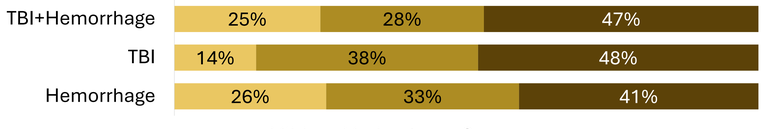
32 Years Median Age

86% Male

31% Penetrating Injury

24% Patients Received Plasma < 6hrs

Injury Severity Distribution



Median Time To Plasma Transfusion from Injury

Injury 0 hr | Plasma Transfusion **2.13 hr** | Treatment Window 6 hr | N = 167

RESULTS

Primary and Secondary Adjusted Hazard Ratios

Outcomes	Treatment Effect Adjusted Hazard Ratio (95% CI)	p-value
7-day Mortality^	0.76 (0.52, 1.11)	0.156
48-hr Mortality	0.74 (0.48, 1.14)	0.173
30-Day Mortality	0.66 (0.45, 0.95)	0.025*
7-day Multiple Organ Failure	2.33 (1.03, 5.29)	0.043*

*^Primary Outcome; *significant findings*

Subgroup Adjusted Hazard Ratios

Penetrating Injury

87% ↓ 7-day mortality
aHR 0.13 (95% CI 0.05–0.31)

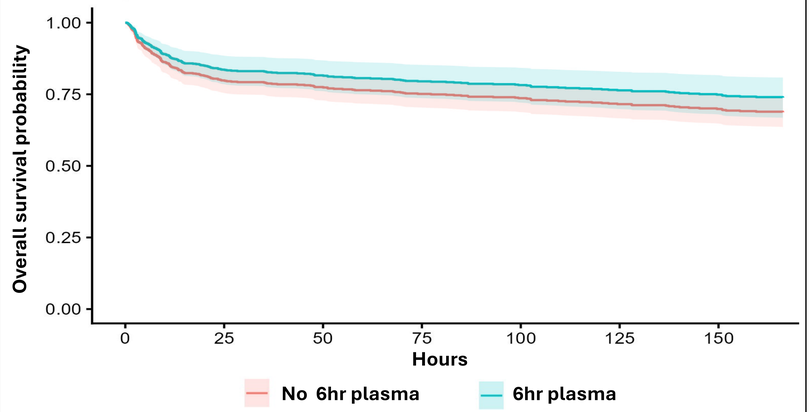
Plasma Transfused within 4hrs

38% ↓ 7-day mortality
aHR 0.62 (95% CI 0.41–0.93)

Other subgroups were analysed, but findings were non-significant.

RESULTS

Adjusted Cox PH Model Survival Curve (7-day), Stratified by Treatment Group



The unadjusted survival curves indicate a significant divergence in survival trajectory between treatment groups.

LIMITATIONS

- Observational design limits causal inference.
- Regional trauma system with routine FDP use; findings not generalizable to all settings.
- Co-administered product timing, sequence, or volume not fully captured; may have influenced outcomes.

CONCLUSIONS

- Plasma transfusion, mostly FDP, within 6 hours of injury is associated with **24% lower hazard of 7-day mortality**.
- Survival benefits persisted in moderate and severe subgroups.
- **Survival** benefits appeared **greatest** when plasma was administered **within 4 hours**.

NEXT STEPS

- Findings support FPD use in austere settings and resource-constrained trauma systems.
- Prospective and interventional studies are needed to confirm these findings and inform context-specific trauma resuscitation practice.

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Questions?
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