Massive Transfusion in Trauma: Does Payer Status Decrease Futile Transfusion?

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BACKGROUND

Blood shortages are a national crisis creating dangerous scenarios for patients requiring massive transfusion protocol (MTP) in the trauma setting. Judicious use of blood product is critical to rescue salvageable patients while refraining from unnecessary MTP to save precious resources. We evaluate RBC transfusion volume and in-ED deaths relationship to payer status as markers of futility in trauma patients receiving MTP.

METHODS

ED trauma activations from database of an urban Level I Trauma Center was analyzed from 1/1/2017 to 06/30/2022. RBC transfusion volume during initial resuscitation, as well as baseline patient and trauma event characteristics and payer status was analyzed. Patients who received massive blood transfusion (>= 5 units of RBC/24 hours) were compared to those who did not. Multivariate analysis assessed relationships between MTP transfusions in the ED and demographic characteristics as well as markers of futility. All analyses were conducted in R.

RESULTS

Patient/Trauma Characteristics

Among the 11,098 patients, ED mortality rate was 1.2% (n=132). The median age of patients receiving MTP was younger (43.2 years vs. 51.3 years, $p < 0.01$). Patients with penetrating trauma were more likely to receive MTP than those without (32.8% vs. 10.1%, $p < 0.001$), while those with blunt force trauma were less likely to have received MTP (67.2% vs. 89.1%, $p < 0.001$). There was no difference in MTP status based on gender (p=0.15), race (p=0.49) or ethnicity (p=0.50).

	MTP TRANSFUSED? YES (N=61)	NO (N=11037)	p-value
Gender			
Female	13 (21.3%)	3641 (33.0%)	0.15
Male	48 (78.7%)	7393 (67.0%)	
Race			
American Indian	0 (0%)	6 (0.1%)	0.49
Asian	7 (11.5%)	1360 (12.3%)	
Black	4 (6.6%)	995 (9.0%)	
Native Hawaiian or Other Pacific Islander	0 (0%)	10 (0.1%)	
White	8 (13.1%)	2149 (19.5%)	
Ethnicity			
Hispanic Origin	20 (32.8%)	3692 (33.5%)	0.50
Non-Hispanic Origin	33 (54.1%)	6362 (57.6%)	
Payor Source			
Medicaid	23 (37.7%)	3342 (30.3%)	0.004
Medicare	4 (6.6%)	2784 (25.2%)	
No Charge	8 (13.1%)	1199 (10.9%)	
Other	7 (11.5%)	1159 (10.5%)	
Private	14 (23.0%)	1944 (17.6%)	
Self	2 (3.3%)	59 (0.5%)	
Unknown	3 (4.9%)	550 (5.0%)	

Table 1. Patient Characteristics by MTP Transfusion Status

Payor Status and MTP Transfusion Status

Patients on Medicaid were more likely to have received MTP (only 37.7% of patients receiving MTP were on Medicaid vs. 62.3% non-Medicaid) representing a statistically significant difference ($p < 0.05$).

Conversely, patients on Medicare were less likely to receive MTP (6.6% of patients receiving MTP on Medicare vs. 93.4% non-Medicare; this result was not statistically significant ($p = 0.255$).

Markers of Futility and MTP Transfusion Status

Injury severity score (ISS) and Probability of Survival (PS) reported in the data were significantly negatively correlated (Kendall coefficient -0.60, $p < 0.01$). ISS was higher in patients receiving MTP than in those who did not (14.7 vs. 7.49, $p < 0.01$). Median PS was lower in this MTP transfusion group (0.88 vs 0.98, $p < 0.001$). Patients who received MTP were more likely to have died-in-ED than those who did not (7.6% vs. 0.5%, $p < 0.001$). The discriminatory value for amount of PRBC transfused alone on whether a patient lived or died was high (AUROC 0.604 [95% CI 0.57 to 0.64]).

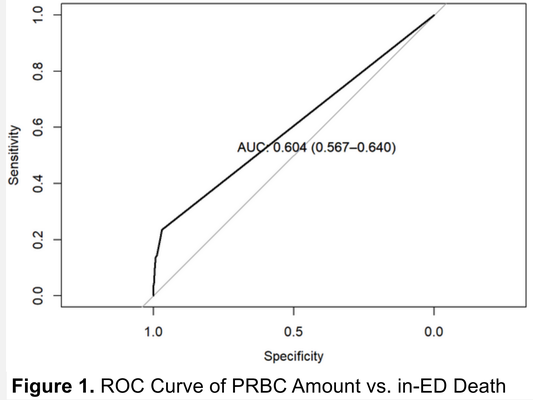


Figure 1. ROC Curve of PRBC Amount vs. in-ED Death

Prediction of in-ED Deaths

Multivariable logistic regression was used to examine the relationship between age, presence of penetrating trauma, Medicaid or Medicare payor status on MTP transfusion status. Results showed that penetrating trauma and PS were statistically important variables ($p < 0.01$), with the likelihood of receiving MTP increasing with penetrating trauma and with lower PS. AUROC for this model was high (0.97 [95%CI 0.94 to 0.99]).

	Coefficient	Standard Error	p-value
Age	0.00	0.01	0.842
Medicaid	0.20	0.30	0.499
Medicare	-0.92	0.61	0.129
Penetrating Trauma	1.29	0.35	0.000 ***
ISS	-0.03	0.03	0.258
PS	-5.74	0.92	0.000 ***
ISS*PS Interaction	0.18	0.03	0.000 ***
Intercept	-1.64	0.98	0.093

Note: '*' indicates statistical significance at the 5% level (p<0.05), '**' indicates statistical significance at the 1% level (p<0.01), '***' indicates statistical analysis at the 0.01% level (p<0.001)

Table 2. Multivariate Logistic Regression of Association of Patient/Trauma Factors and MTP Transfusion Status

SUMMARY & CONCLUSION

Patients with penetrating trauma are more likely to receive MTP, regardless of their probability of survival. Patients over the age of fifty years, Medicare recipients, and patients with blunt trauma are less likely to receive MTP. MTP transfusion is associated with in-ED death. Assessing futility of MTP should be equitable and future transfusion guidelines should consider salvageability in cases with low probability of survival despite age and mechanism.