

Examining the Association Between MELD 3.0 Scores and Intraoperative Blood Component Transfusion During Liver Transplant Surgery

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Background

The Model for End-Stage Liver Disease (MELD) score predicts short-term mortality in patients with end-stage liver disease. MELD 3.0, which adds sex and albumin while capping creatinine, enhances prognostic accuracy and reduces sex-based disparities in organ allocation. Transfusion during orthotopic liver transplantation (OLT) remains common and is associated with worse outcomes, yet the predictive value of MELD 3.0 for intraoperative blood component utilization has not been well studied.

Objective: To evaluate whether preoperative MELD 3.0 score independently predicts intraoperative transfusion use during OLT.

Methods

We performed a single-center retrospective cohort study of 69 adult OLT recipients to evaluate the association between preoperative MELD 3.0 scores and intraoperative blood component utilization. Preoperative variables included MELD 3.0 components, hemoglobin, platelets, and indication for transplant. Intraoperative outcomes included transfused units of packed red blood cells (pRBCs), fresh frozen plasma (FFP), platelets, cryoprecipitate, and estimated blood loss (EBL). Analyses utilized descriptive statistics, Pearson correlations, Mann-Whitney U, and Kruskal-Wallis tests with Bonferroni correction. Multivariable linear regression examined predictors of total blood product use. Significance was set at $p<0.05$.

	ETOH (n = 36)	HCC (n = 15)	Other (n = 17)	P value
Age	48 (48, 57.8)	69 (69, 73)	62 (46, 66)	<.001
MELD 3.0	34 (19.8, 38)	13 (8, 17)	27 (21.5, 32.5)	<.001
pRBC	16.5 (10.3, 20)	11 (7, 20)	12 (11, 14.5)	.12
FFP	17 (11, 20)	11 (5, 20)*	14 (10, 15)	.03
Platelets	3 (2, 3)	1 (1, 2)	3 (2, 4)	<.001
Cryoprecipitate	3 (2, 3)	1 (1, 2)	2 (2, 3)	<.001
Total Units	38 (27, 46.8)	24 (14, 44)*	29 (25.5, 35.5)	.03

Results

The cohort included **52 men (75%)** and **17 women (25%)**, with a median age of **57 years** and median MELD 3.0 score of **27**.

- **Median transfusion volume:** 34 units total; **EBL:** 5500 mL.
- **Sex differences:** Women had higher MELD 3.0 (33 vs. 23 units, $p=0.05$) but similar total transfusion (15 vs. 14 units, $p=0.82$).
- **By indication:** HCC patients had lower MELD 3.0 (13.0) than alcohol-related (34) or other (27) causes ($p<0.001$). HCC recipients received fewer median total blood components than the ETOH group (24 vs. 38 units, $p=0.04$)
- **Regression:** MELD 3.0 independently predicted total intraoperative transfusion ($\beta=0.92$; 95% CI, 0.48-1.37, $p<0.001$). Age, sex, hemoglobin, and diagnosis were not significant covariates.

	Male	Female	P value
MELD 3.0	23 (13-36)	33 (26-36.5)	.05
Total Units	34 (24-46)	34 (24-45)	.82
Hemoglobin	9.1 (8.3-11.7)	8.4 (7.7-9.9)	.047
Total Bilirubin	4.8 (1.5-22.8)	15.9 (7.7-25.1)	.02
INR	1.5 (1.3-2.7)	2.2 (1.7-3.1)	.04
EBL (mL)	5000 (2800-8000)	5500 (4425-7420)	.55

Discussion

MELD 3.0 is a strong, independent predictor of intraoperative blood product utilization during OLT. Higher MELD scores were associated with greater transfusion requirements, reflecting more severe hepatic dysfunction and coagulopathy. In contrast, patients transplanted for HCC had lower MELD scores and required fewer blood products, consistent with better-preserved hepatic function. Sex differences in MELD 3.0 did not translate into transfusion differences, indicating the score better accounts for female disease severity. These findings highlight the value of MELD 3.0 for preoperative risk assessment and resource planning. Prospective, multicenter validation is warranted to confirm its predictive strength across transplant indications.

References

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