Preoperative hemoglobin is key indicator in cardiothoracic surgery

Shea A. Shipton, Nathan J. Clendenen MD, Elijah Christensen PhD, Sean T. Wickers
Department of Anesthesiology, University of Colorado School of Medicine

WHAT WE LEARNED

Among a myriad of key indicators in patients undergoing cardiothoracic surgical procedures hemoglobin is the best predictor of mortality

BACKGROUND

- Over 900,000 cardiac surgeries performed each year
  - Average 30-day mortality is 3.4%.
- Blood loss is common in cardiothoracic surgery
  - Most risk factors are non-modifiable
- A significant exception being pre-operative anemia.

STUDY QUESTION

This study seeks to understand if pre-operative anemia is a key indicator in patient outcomes following cardiothoracic surgery.

METHODS

- Retrospective case cohort study
  - 2,104 patients – 72.1% male
- Patients underwent cardiothoracic surgery between Jan 2011 and Nov 2020
  - Procedures included cardiac valve repair/replacements, implant or removal of VAD, ASD repair, aortic root replacement, ascending aortic aneurism repair and CABG
- Pre-operative blood components compared between survivors and non-survivors
  - Age range from 19-88 years old
    - Subject mortality 4.8%
- Variables measured: Age, Gender, Procedure, Hgb, MPV, RDW and Platelet Count
- All values from earliest available day of surgery
- Nominal logistic multivariate regression analysis was performed for mortality
- Data provided by the Health Data Compass at the University of Colorado

RESULTS

Variable	All	Survivors	Non-Survivors	P-Value
Age	60.6 yrs +/- 13.4	60.6 yrs +/- 13.4	61.7 yrs +/- 12.2	0.4051
Hbg	12.2 g/dl +/- 2.2	12.2 g/dl +/- 2.2	11.2 g/dl +/- 2.5	0.0001
RDW	14.6% +/- 2.3	14.6% +/- 2.3	15.9% +/- 2.5	0.0001
Platelet Count	174 x 10^9/L +/- 83	174 x 10^9/L +/- 84	150 x 10^9/L +/- 76	0.0013
MPV	10.3 fl +/- 0.9	10.3 fl+/- 0.9	10.4 fl+/- 0.9	0.2240
Male	72.1%	72.1%	70.0%	.697

Table 1 – Univariate analysis

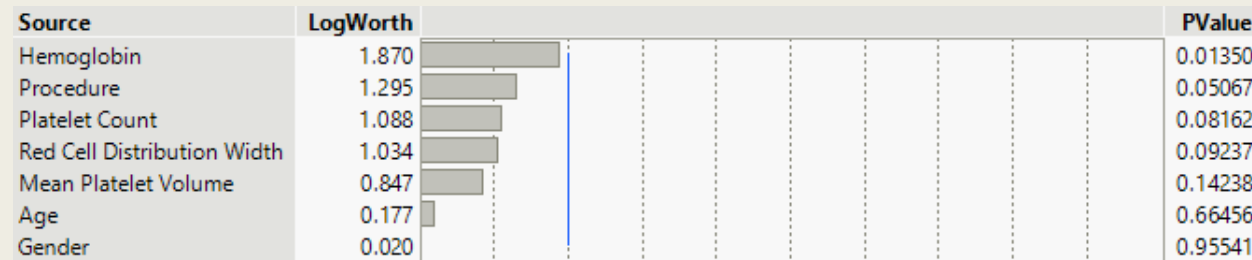| Source	LogWorth		PValue
Hemoglobin	1.870		0.01350
Procedure	1.295		0.05067
Platelet Count	1.088		0.08162
Red Cell Distribution Width	1.034		0.09237
Mean Platelet Volume	0.847		0.14238
Age	0.177		0.66456
Gender	0.020		0.95541

Figure 1 – Multivariate analysis

CONCLUSIONS

- Univariate analysis shows Hgb, RDW and Platelet Count are statistically significant for mortality
- Multivariate analysis indicates that of variables observed Hgb is most statistically significant
- The mean Hgb gap in survivors vs non-survivors is 1 g/dl
- Pre-operative anemia levels are often correctable in non-emergent conditions

LIMITATIONS

- Pre-existing conditions not accounted for in the dataset
- Possible impact of other hematologic factors that were not analyzed in the study

FUTURE DIRECTION

- Further analysis of dataset regarding 30-day incident of AKI, cerebrovascular insult or MI
- Definitive trials of pre-operative iron, B12 and folate therapies to correct pre-operative anemia

ACKNOWLEDGEMENTS

School of Medicine — UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS