

Background

- Anemia is common in critically ill patients and is a known risk factor for poor outcomes.
- Anemia has been associated with worse outcomes in acute coronary syndrome, and heart failure.
- In one single-center study, anemia has also been associated with worse outcomes in cardiac intensive care unit (CICU) patients.
- However, the relationship of Hgb to short-term outcomes in CICU patients has not been studied in a large multicenter study.

Objectives

- Examine the association of Hgb with in-hospital mortality in a multi-center CICU registry.

Methods

- Design:** Multicenter prospective study of tertiary CICUs in North America
- Population:** Patients hospitalized in the CICU
- Inclusion criteria:**
 - All medical CICU admissions with initial Hgb
- Statistics**
 - The primary outcome was in-hospital mortality.
 - Hgb ≥ 14 g/dL was used to define the reference cohort in the analysis.
 - A multivariable logistic regression model was used, adjusting for age, sex, diabetes, eGFR, CKD, history of significant liver disease, active cancer, and SOFA score.
 - We examined three important subgroups comprising of acute myocardial infarction (AMI), AMI with cardiogenic shock (AMI-CS), and non-AMI cardiogenic shock (CS).

Results

- 23,190 admissions were included.
- Median Hgb 12.0 g/dL (25th, 75th %iles: 10.1, 13.8).

Table 1. Patient Characteristics

	Overall	Hgb <8	Hgb ≥ 8 & <10	Hgb ≥ 10 & <12	Hgb ≥ 12 & <14	Hgb ≥ 14
Age*	67	67	69	70	66	61
Female sex	36.7%	45%	45.3%	47.1%	35.8%	18%
BMI*	27.7	26.6	27.2	27.3	27.7	28.6
CAD	35.9%	41.7%	43.9%	39.9%	32.9%	27.5%
Diabetes	34.6%	43.2%	43.9%	39.4%	31.2%	24.2%
eGFR [†]	62 (38-85)	35 (18-64)	43 (23-71)	57 (34-81)	69 (48-89)	74 (55-92)
CKD	23.8%	45.5%	40.2%	29.4%	15.8%	9.2%
Liver Disease	3%	7.1%	4.1%	3%	2.1%	2%
Cancer	6.9%	12.8%	10.9%	8.2%	5.2%	2.9%
SOFA Score [†]	3 (1-7)	6 (4-9)	5 (3-8)	4 (2-7)	3 (1-5)	2 (1-5)

Hgb measured in g/dL. eGFR measured in ml/min/1.73m². BMI = body-mass index (kg/m²), CAD = coronary artery disease, eGFR = estimated glomerular filtration rate, CKD = chronic kidney disease, SOFA = sequential organ failure assessment
* = median; [†] = median (25th, 75th %iles)

Fig 1. Crude Association of Hgb with In-Hospital Mortality

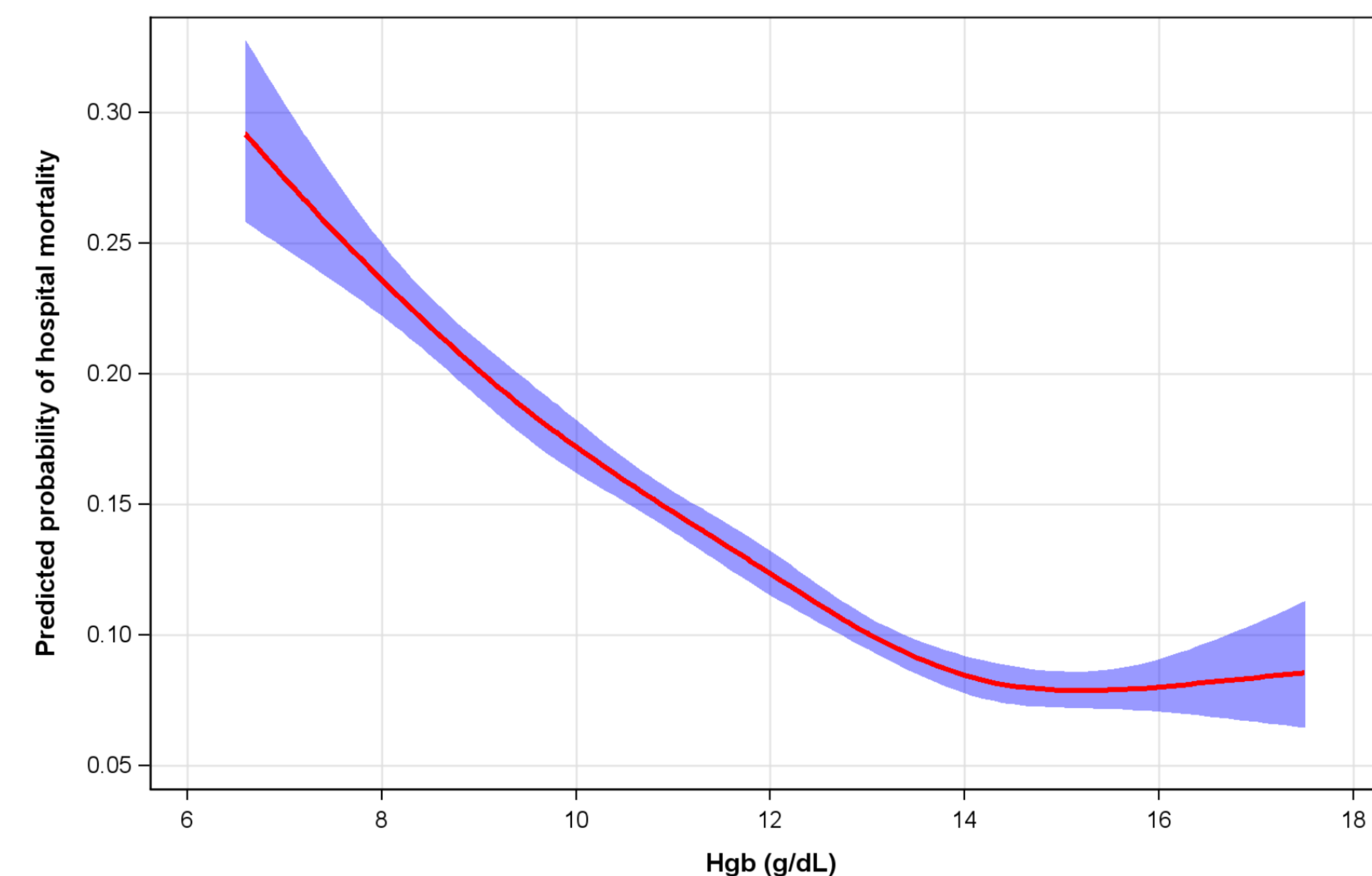


Fig 2. Hgb and Adjusted Risk of In-Hospital Death

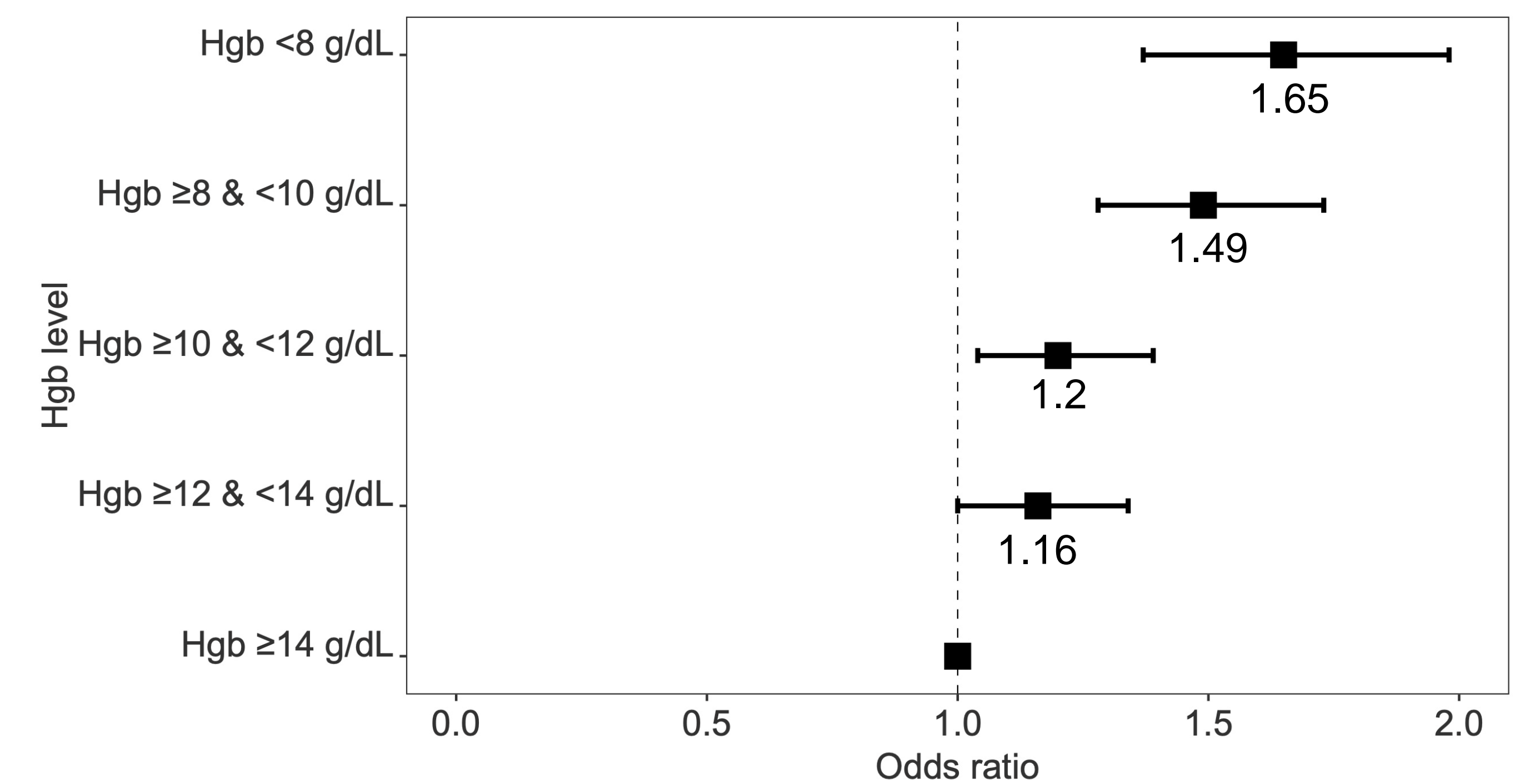


Table 2. Hgb and In-Hospital Death in Key Subgroups

Subgroup	Event Rate (Hgb <8 vs. ≥ 14 g/dL)	aOR for Hgb <8 vs. ≥ 14 g/dL	95% CI
Overall	25.8 v. 8%	1.65	1.37, 1.98
AMI (no CS) (n=5964)	17.3 v. 2.2%	1.84	1.03, 3.28
AMI-CS (n=1261)	55.9 v. 31.3%	1.32	0.69, 2.5
CS (n=3337)	38.2 v. 20.1%	1.72	1.17, 2.53

Conclusions

- Lower Hgb level is independently associated with higher in-hospital mortality in a linear relationship up to ~ 14 g/dL.
- Future studies should include examining the mechanism(s) of risk with Hgb at levels well above established transfusion thresholds.

Limitations

- A causal relationship cannot be determined.
- Residual confounding by other non-cardiac or cardiac comorbidities may exist and may be driving lower Hgb levels.

Acknowledgements: TIMI study group (Brigham and Women's Hospital) and Ayushi Gupta (University of Washington Department of Medicine) for analytical support.

Please contact Christine Chow at cc600@uw.edu for any questions.