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# Anemia at Discharge and Risk of Readmissions in Elderly Patients

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 Florida State University Internal Medicine Residency Training Program at Sarasota Memorial Hospital



## Research Objective

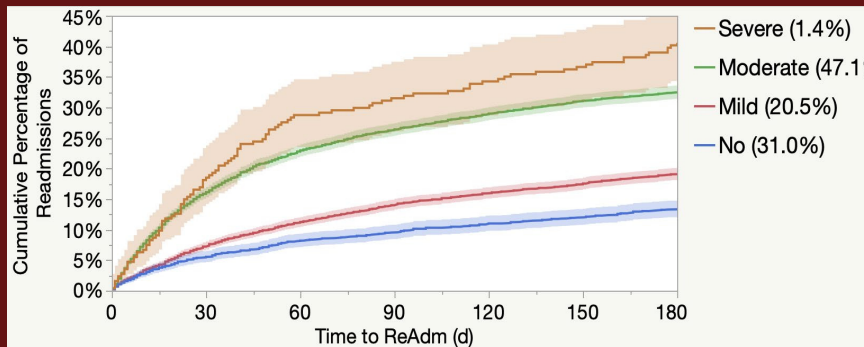
- To evaluate whether anemia at hospital discharge is an independent risk factor for all-cause readmission.
- Study patients included those readmitted within 180 days of discharge, not to hospice, from an index admission in patients  $\geq 65$  years old admitted to the Hospital Medicine Service of a community-based teaching hospital.

## Methods

- Design:** Retrospective observational study exempted by the Institutional Review Board for a clinical electronic data abstraction from September 2009 through June 2019.
- Primary Measure:** Anemia categories classified using World Health Organization (WHO) (1) criteria were applied for serum Hb levels obtained at discharge for:
  - Females as mild (11.0 – 11.9 g/dL), moderate (8.0 – 10.9 g/dL), and severe (<8.0 g/dL); and
  - Males as mild (11.0 - 12.9 g/dL), moderate (8.0 - 10.9 g/dL), and severe (<8.0 g/dL).
- Primary Outcome and Analytic Plan**
- Time to readmission (ReAdm) with mild, moderate, severe, or no anemia was compared at discharge of index hospitalization(s) using Kaplan Meier estimates with covariates controlled using Cox modeling and relative impact assessed with Random Forest model.
- Continuous variables summarized as mean (SD) or median (interquartile range) were contrasted using Kruskal-Wallis ANOVA.
- Categorical variables summarized as proportions were compared using chi square or Fisher exact test.
- Statistical tests were two-tailed with  $p < .05$  considered significant.

## Results

<b>Study patients</b>	<ul style="list-style-type: none"> <li>13,526 with 18,793 discharges (ReAdm&gt;180d was considered a new index admission)</li> <li>49% females (79 <math>\pm</math> 9 years)</li> <li>51% males (77 <math>\pm</math> 8 years)</li> <li>90% White, 6% AfAm/Black, 4% Other</li> </ul>		
<b>Prevalence and mean Hb of anemia category</b>	<ul style="list-style-type: none"> <li>No (31.0%) (13.1 <math>\pm</math> 0.9 g/dL)</li> <li>Mild (20.5%) (12.5 <math>\pm</math> 1.3 g/dL)</li> <li>Moderate (47.1%) (9.7 <math>\pm</math> 0.8 g/dL)</li> <li>Severe (1.4%) (7.5 <math>\pm</math> 0.4 g/dL)</li> </ul>		
<b>Significant co-variates (P&lt;.05, two-tailed)</b>	<ul style="list-style-type: none"> <li>Age, sex, CHF, Diabetes Mellitus, Hypertension, Pulmonary Disease, Renal Disease, Peripheral Vascular Disease, APR-DRG (Severity of Illness), and discharge destination (home, skilled nursing facility, rehabilitation facility, or other)</li> </ul>		
<b>Median time to ReAdm (d)</b>	<table border="0"> <tr> <td> <ul style="list-style-type: none"> <li>No (44, 13-96)<sup>a</sup></li> <li>Mild (46, 18-93)<sup>b</sup></li> <li>Moderate (31, 11-72)<sup>c</sup></li> <li>Severe (34, 16-83)<sup>d</sup></li> </ul> </td> <td> <ul style="list-style-type: none"> <li>a = b, p&gt;.05</li> <li>c=d, p&gt;.05</li> <li>c&lt;a/b, p&lt;.01</li> <li>d&lt;a/b, p&lt;.01</li> </ul> </td> </tr> </table>	<ul style="list-style-type: none"> <li>No (44, 13-96)<sup>a</sup></li> <li>Mild (46, 18-93)<sup>b</sup></li> <li>Moderate (31, 11-72)<sup>c</sup></li> <li>Severe (34, 16-83)<sup>d</sup></li> </ul>	<ul style="list-style-type: none"> <li>a = b, p&gt;.05</li> <li>c=d, p&gt;.05</li> <li>c&lt;a/b, p&lt;.01</li> <li>d&lt;a/b, p&lt;.01</li> </ul>
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Candidate Predictors (Covariates)	ReAdm=<180d Risk	
	Explained Variance	Rank
Hb (Visit Last)	41%	1
Congestive Heart Failure	14%	2
Renal Disease	12%	3
Discharge Destination	9%	4
Pulmonary Disease	8%	5
APR-DRG (Severity of Illness)	5%	6
Peripheral Vascular Disease	4%	7
Age	3%	8
Diabetes Mellitus	2%	9
Sex	2%	10
Hypertension	0%	11

Continuous versus Threshold Assessment of Anemia	ReAdm=<180d	
	Explained Variance	Rank
Hb (Visit Last)	73%	1
WHO-Severity (Last Hb)	27%	2

## Conclusion

- Discharge anemia exhibited the highest explained variance of all covariates with significant risk for ReAdm=<180d.
- Absolute discharge [Hb] captured 46% more variance in ReAdm risk than established WHO thresholds.
- Tailored anemia care during index hospitalization could offer clinical advantages to mitigate risk for readmission.

## Reference

1. WHO. Haemoglobin concentrations for the diagnosis of anaemia. At <http://www.who.int/vmnis/indicators/haemoglobin.pdf>.