Preoperative hemoglobin is key indicator in cardiothoracic surgery

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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.

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

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, RDW, Platelet Count, MPV
- 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

<table>
<thead>
<tr>
<th>Variable</th>
<th>All</th>
<th>Survivors</th>
<th>Non-Survivors</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>60.6 yrs +/- 13.4</td>
<td>60.6 yrs +/- 13.4</td>
<td>6.17 yrs +/- 12.2</td>
<td>0.4051</td>
</tr>
<tr>
<td>Hgb</td>
<td>12.2 g/dl +/- 2.2</td>
<td>12.2 g/dl +/- 2.2</td>
<td>11.2 g/dl +/- 2.5</td>
<td>0.0001</td>
</tr>
<tr>
<td>RDW</td>
<td>14.6% +/- 2.3</td>
<td>14.6% +/- 2.3</td>
<td>15.9% +/- 2.5</td>
<td>0.0001</td>
</tr>
<tr>
<td>Platelet Count</td>
<td>174 x 10^6/L +/- 83</td>
<td>174 x 10^6/L +/- 84</td>
<td>150 x 10^6/L +/- 76</td>
<td>0.0013</td>
</tr>
<tr>
<td>MPV</td>
<td>10.3 fl +/- 0.9</td>
<td>10.3 fl +/- 0.9</td>
<td>10.4 fl +/- 0.9</td>
<td>0.2240</td>
</tr>
<tr>
<td>Male</td>
<td>72.1%</td>
<td>72.1%</td>
<td>70.0%</td>
<td>.697</td>
</tr>
</tbody>
</table>

Table 1 – Univariate 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

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