A COMPARISON OF HEMOGLOBIN MEASURED BY CO-OXIMETRY AND CENTRAL LABORATORY DURING MAJOR SPINE FUSION SURGERY

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Introduction

• Transfusion of red blood cells remains the first line therapy for treating hypoxia due to anaemia.
• Transfusion thresholds, determined by patient comorbidities and evidence of active bleeding, are used to determine when inadequate oxygen delivery may be occurring that requires treatment with RBCs.
• There are a multitude of factors affecting the accuracy of hemoglobin concentration measurements, including the type of measurement device and the laboratory methodology used.

Hypothesis

• This study aims to evaluate if the hemoglobin concentration obtained by means of arterial blood gas (ABG) co-oximetry and central laboratory techniques (CBC) clinically correlate when using simultaneous measurements of hemoglobin concentration obtained during complex spine fusion surgery.
• We hypothesized that the two techniques would produce measurements that varied more than the stated resolution of 0.1 g/dL, especially in the range of hemoglobin values (e.g., 7-10 g/dL) where most transfusion decisions are made.

Methods

• 348 patients who underwent spinal fusion of greater than 3 bony levels between September 2006, and September 2010, with concurrent ABG and CBC samples were identified.
• The mean difference between pairs of measured hemoglobin values was determined using limits of agreement analysis. Error grid analysis was used to delineate correlation of samples in relation to hemoglobin values within the range considered for transfusion.

Results

<table>
<thead>
<tr>
<th>Hemoglobin Level (g/dL)</th>
<th>Number of Pairs (N)</th>
<th>Limits of Agreement (g/dL)</th>
<th>Upper 99% CI</th>
<th>Lower 99% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.0-9.0</td>
<td>616 (35.5%)</td>
<td>-1.47 to 1.07</td>
<td>0.86</td>
<td>0.50</td>
</tr>
<tr>
<td>9.0-11.0</td>
<td>503 (29.8%)</td>
<td>-2.00 to 1.69</td>
<td>0.92</td>
<td>0.59</td>
</tr>
<tr>
<td>11.0-13.0</td>
<td>354 (20.7%)</td>
<td>-2.54 to 2.14</td>
<td>0.94</td>
<td>0.61</td>
</tr>
<tr>
<td>13.0+</td>
<td>105 (6.2%)</td>
<td>-3.07 to 1.01</td>
<td>0.96</td>
<td>0.54</td>
</tr>
</tbody>
</table>

Discussion and Conclusions

• The current study does not identify a gold standard of hemoglobin measurement.
• Hemoglobin measurement by co-oximetry (ABG) and central laboratory analysis (CBC) are not interchangeable.
• Further studies investigating novel point-of-care and continuous hemoglobin monitoring technology should be consistently compared to either ABG or CBC alone, and attempt to focus on hemoglobin values between 7 and 10 g/dL.
• During management of acute blood loss, particularly when implementing a restrictive approach, consideration should be given to the mean difference in hemoglobin values between these two commonly employed measurement techniques.