Transforming Hemoglobin Measurement in Trauma Patients: Non-Invasive Spot Check Hemoglobin

Objectives
Studies have reported poor correlation between continuous non-invasive hemoglobin (Hgb) devices with invasive Hgb in trauma patients. Advancements in technology have allowed for a Spot check non-invasive Hgb measurement. The aim of our study was to assess non-invasive Spot-check Hgb measurement using the Pronto-7® Pulse Co-Oximeter in trauma patients.

Methods
We performed a prospective cohort analysis of all trauma patients presenting to our level 1 trauma center. Invasive (IHgb) and Spot-check hemoglobin measurements were obtained simultaneously upon presentation of the patient. Spot-check was measured three times for each invasive Hgb value. We defined normal Hgb as >8mg/dL. Spearmen and Bland-Altman correlation plot analysis was performed.

Results
A total of 525 patients had attempted Spot-check Hgb and success rate was 86%(n=450). We recorded 1,350 Spot check Hgb and 450 IHgb. The mean age was 41±21 years, 74% male, and mean ISS 20±13. 38% (n=173) patients had Hgb≤8. The mean IHgb was 11.5±4.36g/dL, mean Spot-check Hgb 11.4±2.5g/dL, and the mean difference mean was 0.1±1.9g/dL (p<0.2). Sensitivity was 96%, accuracy was 77%, positive predictive value was 73%, negative predictive value was 88%, and specificity was 44%. Spearman Correlation plot coefficient revealed a correlation of R2=0.77 and R=0.86. Spot-check Hgb values had strong correlation with invasive Hgb measurements (ICC=0.73;CI: 0.7-0.8) and also within the repetitive Spot-check Hgb values (ICC=0.92;CI:0.8-0.9). Bland-Altman plot revealed that 98.7% of the measurements within 2 standard deviations of mean difference.

Conclusions
Contrary to continuous non-invasive Hgb monitoring, the Spot-check Hgb monitor allows for immediate and accurate Hgb measurements in critically ill trauma patients. Spot-check Hgb monitoring has excellent correlation with invasive Hgb measurements. This new technology has the potential to transform the practice of trauma care.

Spearman Correlation Plot: Invasive and spot check Hgb